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AWARENESS, ATTITUDES AND RESPONSE TO THE SUGAR-SWEETENED BEVERAGE TAX AMONG CONSUMERS IN PIETERMARITZBURG, KWAZULU-NATAL

BY

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ABSTRACT

Introduction: Obesity and overweight have been identified as serious health problems both globally and in South Africa. One of the contributing factors to this epidemic is the consumption of sugar-sweetened beverages (SSBs), high in sugar and energy. Sugar-sweetened beverages are defined as: 'beverages that contain added caloric sweeteners such as sucrose, high fructose corn syrup or fruit juice concentrates' and include soft drinks, fruit drinks, sports/energy drinks, vitamin water drinks, sweetened ice tea and lemonade. The South African Minister of Finance implemented the sugar-sweetened beverage (SSB) tax on 01 April 2018, as part of a multidisciplinary strategy to alleviate the obesity problem. The tax is calculated according to the direct proportion of added sugar at 2.1 cents per gram of sugar that exceeds 4 g per 100 ml, resulting in an approximate 20% increase in the price of SSBs. Given that the SSB tax is relatively new in South Africa, there is a need to assess the awareness, attitudes and responses of South African consumers to the tax.

Aim: This study aimed to assess the awareness, attitudes and response to the sugar-sweetened beverage tax among consumers in Pietermaritzburg, KwaZulu-Natal.

Objectives: (i) To determine if consumers in Pietermaritzburg, KwaZulu-Natal are aware of the SSB tax (ii) To determine the demographic characteristics of consumers who are aware of the SSB tax in Pietermaritzburg, KwaZulu-Natal (iii) To determine the attitudes of consumers in Pietermaritzburg, KwaZulu-Natal towards the SSB tax (iv) To determine the response of consumers in Pietermaritzburg, KwaZulu-Natal to the SSB tax, in terms of purchasing behaviour.

Methods: An observational cross-sectional study was conducted at seven shopping centres in Pietermaritzburg, using a self-administered questionnaire, developed for this study. The questionnaire was used to gather data on demographic characteristics, awareness and response to the SSB tax. Data was analysed using the IBM Statistical Package for Social Science (SPSS) version 23.0.

Results: The participants were mostly 18-30 year old Indian or African consumers, with a low income and in possession of a matric certificate or tertiary qualification. A significant number of consumers were aware of the South African SSB tax (58.1%; n=229), however, almost half did not know when it was implemented (47.6%; n=109). Indian and white consumers were significantly more aware of the SSB tax compared to African consumers ($p<0.0005$). In

addition, awareness increased according to income level (more than R40 000 per month) and age (31-50 year olds) ($p<0.0005$).

The consumers were divided in their attitudes towards the SSB tax. Nearly equal amounts of participants were in agreement (35.8%; n=141) or disagreement (37.0%; n=146) with the SSB tax. Furthermore, many believed that it would benefit the country in terms of the economy or health (43.6%; n=100). However, some felt that they could not afford the tax (21.8%; n=50) or felt that the money would go to the government and not benefit the public (12.7%; n=29). Many also believed that the South African economy would be negatively affected in terms of job losses (41.1%; n=162). However, there was neither significant agreement nor significant disagreement that the SSB tax would reduce obesity or consumption rates of SSBs. In addition, many indicated that the government should not interfere with the beverage choices of South Africans (41.9%; n=165).

About half of the participants stated that they would make healthier beverage choices, following the implementation of the SSB tax (53.6%; n=211). Moreover, half of the consumers indicated that they would opt for water (50.8%; n=200). Other common alternatives included 100% fruit juice (49.2%; n=194) and milk and milk products (30.2%; n=119). Finally, most participants suggested that they would like the government to help reduce the prevalence of obesity by supporting an increase in nutrition education (27.3%; n=68) and physical activity (22.5%; n=56).

Conclusion: This study aimed to assess the awareness, attitudes and response to the SSB tax among consumers in Pietermaritzburg, KwaZulu-Natal. The majority of the consumers were aware of the South African SSB tax; however, almost half did not know when it was implemented. Indian and White consumers, between the ages of 31 and 50 years old, earning more than R40 000 per month, were the most aware of the South African SSB tax. Half of the consumers were in favour of the SSB tax and felt that it would improve health. The same number also indicated that they would choose water as an alternative, if SSBs were no longer affordable to them, followed by 100% fruit juice and milk and milk products. The differences in attitudes towards the SSB tax show that there is a need for consumers to know more about the SSB tax. Hence, more awareness campaigns are required. Future research should investigate the impact of the SSB tax on health, obesity rates and the economy.

PREFACE

This dissertation was written between June 2018 and April 2019 using data collected from shopping centres in Pietermaritzburg, KwaZulu-Natal, under the supervision of Dr Kirthee Pillay.

Signed:  Date: 19 August 2019

Nikita Baijnath (Candidate)

As supervisor of the candidate, I agree to the submission of this dissertation.

Signed: Date: 19 August 2019

Dr Kirthee Pillay (Supervisor)

DECLARATION OF ORIGINALITY

I, Nikita Baijnath, hereby declare that:

1. The entirety of the work contained in this dissertation is my original work, except where otherwise stated.
2. This dissertation, or any part of it, has not been submitted for any degree or examination at any other university.
3. Where other sources have been used, they have not been copied and have been properly acknowledged.
4. This dissertation does not contain text, graphics or tables copied and pasted from the internet, unless specifically acknowledged, and the source being detailed in the dissertation and in the relevant reference section.

Signed:  Date: 19 August 2019

Nikita Baijnath (Candidate)

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CHAPTER 1: INTRODUCTION, THE PROBLEM AND ITS SETTING

1.1 Importance of the study

According to the World Health Organization (WHO) (2017), the prevalence of obesity across the globe has tripled since 1975. In addition, most of the world's population live in countries where overweight and obesity kills more people than under nutrition. In 2016, more than 1.9 billion adults were overweight, with over 650 million of these, obese (WHO 2017). Statistics from the WHO (2017), showed that 39% of adults aged 18 years old and older, were overweight worldwide. Africa faces a growing obesity problem (Adeboye, Bermano & Rolland 2012). By 2020, 12.7% of African children will be overweight or obese compared with 8.5% in 2010 (Adeboye *et al* 2012). In South Africa, 13.5% and 42% of adult men and women, respectively, are obese (Ng *et al* 2014). According to the South African National Health and Nutrition Examination Survey (SANHANES-1) study, 11% of males and 39% of females in South Africa, were obese (Shisana, Labadarios, Rehle, Simbayi, Zuma, Dhansay, Reddy, Parker, Hoosain, Naidoo, Hongoro, Mchiza, Steyn, Dwane, Makoae, Maluleke, Ramlagan, Zungu, Evans, Jacobs, Faber & SANHANES-1 Team 2013). A more recent study, the South Africa Demographic and Health Survey (SADHS) from 2016, indicated that 68% of women in South Africa were overweight or obese, while 31% of men were overweight or obese. In addition, one out of five women were severely obese (South African Demographic and Health Study [SADHS] 2016).

According to the WHO, 2.8 million deaths worldwide occur annually due to obesity. This is because obesity leads to various non-communicable diseases (NCDs) such as cardiovascular disease (CVD), cancer, chronic respiratory disease and type 2 diabetes (WHO 2014). The rates of obesity in South Africa have risen over the past thirty years, leaving it the 'most obese' country in sub-Saharan Africa (National Treasury 2016). In addition, low and middle-income countries, including South Africa, are most affected by obesity, yet obesity is preventable. According to the South African National Department of Health (2013), various methods to reduce obesity have been tested and have shown some positive effects. These methods include food-advertising regulations, food labelling regulations, worksite interventions, mass media campaigns, school-based interventions and physician counselling. South Africa has recently introduced a sugar tax, as an additional strategy to reduce the prevalence of obesity (National Treasury 2016).

In February 2016, the South African Minister of Finance proposed the introduction of a tax on sugar-sweetened beverages (SSBs) (National Treasury 2016). This tax was eventually implemented in 01 April 2018, with the aim of decreasing excessive sugar intake by South Africans, thereby, reducing obesity and its complications. By implementing this tax, the government implies that producers and consumers would 'pay' for the negative consequences of manufacturing or purchasing these products (National Treasury 2016). The tax is calculated according to the direct proportion of added sugar at a rate of 2.29 cents per gram (National Treasury 2016). For example, a 330 ml Coke contains 35 g of sugar, so an additional 80.15 cents is added to the cost of this product. With this being said, the cost of most SSBs will increase by approximately 20% (National Treasury 2016). Studies show that a 20% tax on SSBs is required to have an impact on the consumption and/or possible positive health outcomes (Langley, Muirie, Crawford & Walsh 2017; National Treasury 2016). After the tax was implemented on 01 April 2018, it was established that the final rate had been fixed at 2.1 cents per gram of the sugar content that exceeds 4 g per 100 ml (Hofmeyer 2018).

Sugar-sweetened beverages are defined as: 'beverages that contain added caloric sweeteners such as sucrose, high fructose corn syrup or fruit juice concentrates' (National Treasury 2016). These include soft drinks, fruit drinks, sports/energy drinks, vitamin water drinks, sweetened ice tea and lemonade. Unsweetened milk and a 100% fruit juice are exempt from the tax as they contain intrinsic sugars (not added sugar). Artificially sweetened beverages are also exempt, as they do not contain caloric sweeteners. The actual sugar content (in grams) of the beverages is taxed (National Treasury 2016).

Sugar-sweetened beverages provide liquid calories and are a major contributor to increased energy intake and thereby, obesity (Woodward-Lopez, Kao & Ritchie 2010). Furthermore, they do not provide a feeling of fullness or satiety and cannot suppress appetite. Sugar-sweetened beverages have little or no nutritional value and there is strong evidence that these products contribute to weight gain and health problems (Woodward-Lopez *et al* 2010). Sugar-sweetened beverages are processed differently to food in the body (Lavin & Timson 2013); they are consumed quickly and readily converted to body fat (WHO 2015). Although total daily added sugar intake should be less than 10% of total energy intake, most SSBs provide nearly 10% of added energy in the form of added sugar (WHO 2015). This indicates that SSBs make up a substantial proportion of sugar intake in the diet (Cabrera Escobar, Veerman, Tollman, Bertram & Hofman 2013).

Over the years, the price of SSBs have decreased and the consumption has increased globally (Powel, Chriqui, Khan, Wada & Chaloupka 2013). In addition, social and economic factors have changed; there has been an increase in urbanisation and industrialisation, increased marketing and technology and a lack of accurate nutrition information (Roberto, Swinburn, Hawkes, Huang, Costa, Ashe, Zwicker, Cawley & Brownell 2015). The reasons behind the expansion of the SSB market include affordability, availability and acceptability (National Treasury 2016). The SSB tax provides a simple and easy way to recoup costs generated by obesity (Duckett & Swerissen 2016). The tax amounts are definite for each specific brand in accordance with the sugar content, which is given in the nutritional information on the product label (Briggs, Mytton, Kehlbacher, Tiffin, Rayner & Scarborough 2013).

There are many potential advantages to the SSB tax. According to National Treasury (2016), the SSB tax can be implemented quickly and the administration costs are low. In addition, the tax can correct market failures, influence purchasing decisions of the public and influence SSB manufacturers to reformulate to less (or zero) sugar options (National Treasury 2016). Ideally, the tax generated should be used to subsidise the cost of healthy foods, such as fruit or vegetables [Association for Dietetics in South Africa (ADSA) 2017], or to fund other anti-obesity interventions (Duckett & Swisseran 2016). The poorer population will be most affected by the SSB tax and may be less likely to purchase SSBs (Jeffery 2016). Since South Africa is mainly a low-income country, the country may likely benefit the most from a SSB tax (Jeffery 2016). Furthermore, the SSB tax will generate a large sum of revenue for the government (Langley *et al* 2017).

One of the disadvantages of an SSB tax is that consumers may turn to other sources of high energy (or high sugar) food or drink items, in order to make up for their reduced sugar and energy intake (Langley *et al* 2017). In addition, if manufacturers do reformulate a lower sugar SSB, consumers may end up buying larger quantities of this product. Therefore, there will be no effect on sugar consumption (Langley *et al* 2017). There are also concerns regarding the poor, who spend a larger portion of their income on food, in that the tax may force a heavier burden on them (Jeffery 2016). After the tax implementation, there may be administrative concerns and tax evasion due to classification anomalies (National Treasury 2016). The main concern about the SSB tax is the fact that many jobs will be lost and many businesses will have to close down (National Treasury 2016). This is a concern as South Africa already has high rates of unemployment (National Treasury 2016).

Due to the negative health effects of SSBs, there is a need to limit their consumption. Existing literature shows that an increase in the prices of SSBs leads to a decrease in SSB consumption (Langley *et al* 2017; Duckett & Swerissen 2016; Jeffery 2016). According to ADSA (2017), there are limited studies showing the impact of an SSB tax and the reactions of consumers to the tax in South Africa. There is currently ongoing debate in South Africa about the SSB tax and its implications on the South African economy and health. As a result, this study aimed to assess the awareness, attitudes and response to the SSB tax among consumers in Pietermaritzburg, KwaZulu-Natal.

1.2 Statement of the problem

To assess the awareness, attitudes and response to the SSB tax among consumers in Pietermaritzburg, KwaZulu-Natal.

1.3 Type of study

A cross-sectional descriptive study was conducted.

1.4 Objectives

The following objectives were investigated:

1.4.1 To determine if consumers in Pietermaritzburg, KwaZulu-Natal are aware of the SSB tax.

1.4.2 To determine the demographic characteristics of consumers who are aware of the SSB tax in Pietermaritzburg, KwaZulu-Natal.

1.4.3 To determine the attitudes of consumers in Pietermaritzburg, KwaZulu-Natal towards the SSB tax.

1.4.4 To determine the response of consumers in Pietermaritzburg, KwaZulu-Natal to the SSB tax, in terms of purchasing behaviour.

1.5 Hypotheses

The following hypotheses were tested:

1.5.1 The majority of consumers would not be aware of the SSB tax.

1.5.2 The demographic characteristics of those who were aware of the SSB tax, would be affluent, educated individuals from a variety of race and age groups.

1.5.3 Consumers would have a negative attitude towards the SSB tax.

1.5.4 Consumers would decide to continue to purchase SSBs regardless of the price increases due to the SSB tax. Those who could not afford the SSBs after the tax, would decide to replace the SSBs with other high sugar options such as confectionaries and 100% fruit juice.

1.6 Study parameters

The inclusion criteria for the study were as follows:

1.6.1 Only consumers who resided in Pietermaritzburg and who understood English were included in the study.

1.6.2 Only consumers over the age of 18 years were included in the study, as they were more likely to make their own food purchasing decisions.

1.6.3 Data collection only took place at those shopping centres which gave approval to participate in the study. These included Truro Plaza, Derby Place, Cascades, Scottsville Mall, Laager Centre, Victoria Centre and Southgate Mall in Pietermaritzburg.

1.7 Assumptions

The following assumptions were made:

1.7.1 The consumers understood the questions in the questionnaire.

1.7.2 The consumers were honest in answering the questionnaire.

1.8 Definition of terms

- **Added sugar**: Monosaccharides (glucose/fructose) and disaccharides (sucrose) which are added to foods or drinks by the manufacturer, cook or consumer (WHO 2014).
- **Attitude**: A mental state of readiness which is organised through experience (Pickens 2005, p44). This exerts an influence on the person's response to objects or situations. Attitudes can also be defined as a tendency to act in a particular way due to previous experience. Attitudes explain behaviours and are a complex of personality, beliefs, values, behaviours and motivations. Attitudes can define how a person views and behaves towards situations or objects (Pickens 2005, p44).
- **Body mass index**: Is determined using the equation W/H^2, in which W=weight in kg and H=height in m^2 (kg/m^2). Body mass index may be used as a screening tool to determine whether weight is linked to increased risk for health problems (Mahan, Escott-Stump & Raymond 2016, p469).

- **Consumer**: A consumer is an individual with purchasing power who may, or may not, be influenced by marketing and advertisements. A consumer buys products (or services) for their own use and not for resale (Brodie, Ilic, Juric & Hollebeek 2013).
- **Non-communicable diseases**: These are also referred to as chronic diseases of lifestyle. These diseases occur over longer periods and result from genetic, environmental, psychological and behavioural factors. Non-communicable diseases mainly affect low and middle-income countries. More than three quarters of global deaths due to NCDs occur in these categories. Some examples of NCDs are strokes, cancers and diabetes (WHO 2014).
- **Obesity**: A condition of excessive fatness either generalised or localised (Mahan *et al* 2016, p469).
- **Overweight**: A state in which weight exceeds a standard (body mass index) based on height (Mahan *et al* 2016, p469).
- **Sugar-sweetened beverages**: Drinks which usually contain carbonated water and a sweetener (natural or artificial) (McSweeney 2016). The sweetener could be sugar, high fructose corn syrup, fruit juice or sugar substitutes, or some combination of these. In addition, SSBs may contain caffeine, colourings, preservatives and other ingredients. The alcohol content needs to be less than 0.5% of the total volume in order for it to be classified as a non-alcoholic beverage. Sugar-sweetened beverages may also be referred to as soft drinks, fizzy drinks, sodas, tonic/mineral/sparkling beverages or carbonated drinks, depending on the country of origin (McSweeney 2016). According to the WHO (2015), SSBs are 'products containing added sugar, corn or fruit juice concentrates and include carbonates, fruit drinks, sports drinks, energy drinks, vitamin water, sweetened ice tea and lemonade'.
- **Sugar-sweetened beverage tax**: A sugar-sweetened beverage tax is a tax that is implemented to reduce the consumption of drinks containing added sugar (National Treasury 2016).

1.9 Abbreviations

ADSA: The Association for Dietetics in South Africa
BMI: Body mass index
COPD: Chronic obstructive pulmonary disease
CVD: Cardiovascular disease
FAO: Food and Agriculture Organization
FBDGs: Food based dietary guidelines
GDP: Gross domestic profit
HIV: Human immunodeficiency virus
HSSREC: Humanities and social science research ethics committee
NCDs: Non-communicable diseases
SADHS: South African Demographic Health Survey
SANHANES: South African National Health and Nutrition Examination Survey
SSB: Sugar-sweetened beverage
SSBs: Sugar-sweetened beverages
VAT: Value-added tax
WHO: World Health Organization

1.10 Summary

The rates of overweight and obesity worldwide, including South Africa, are steadily increasing. One of the independent factors contributing to this problem, is the high intake of SSBs. In order to alleviate this problem, the South African Minister of Finance implemented the SSB tax on the 01 April 2018. Little is known about whether consumers are aware of the tax and their attitudes towards it. This study therefore aimed to assess the consumer awareness, attitudes and response (in terms of purchasing behaviour), to the SSB tax in Pietermaritzburg, KwaZulu-Natal. This chapter has covered the importance of the study, the type of study, objectives, hypotheses, study parameters and assumptions. A review of the related literature is presented in the next chapter.

CHAPTER 2: REVIEW OF RELATED LITERATURE

2.1 Introduction

According to the WHO (2017), 39% of adults were overweight and 13% were obese, worldwide in 2016. Global statistics on children and adolescents, indicate that 340 million were overweight or obese in 2016 (WHO 2017). In Africa, 8.5% of children were overweight or obese in 2010. This is expected to increase to 12.7% by 2020 (Adeboye *et al* 2012). In South Africa, 13.5% of men and 42% of women are obese (Ng *et al* 2014). A recent study conducted in 2016, indicated that 68% of women in South Africa were overweight or obese, while 31% of men were overweight or obese. Moreover, the study found that 1 out of 5 women were severely obese (SADHS 2016). Although obesity can be prevented through a healthy lifestyle, the rates of obesity in South Africa have risen over the past thirty years. Obesity has become a serious and complex problem, which requires a collection of efforts to solve (WHO 2017). A SSB tax was implemented in South Africa on 01 April 2018, as SSBs make up a substantial proportion of added sugar intake and contribute no nutritional value to the diet (Cabrera Escobar *et al* 2013). Apart from taxing for a positive health outcome, an SSB tax can bring in revenue for the government and fund anti-obesity interventions (National Treasury 2016). However, the outcomes and impacts concerning health and economic factors in South Africa are not yet measured (ADSA 2017). The sugar tax has already been implemented in various countries such as Mexico, France and the United States of America (USA), which could provide a basis for understanding the response to the South African SSB tax (Dobbs, Sawers, Thompson, Manyika, Woetzel, Child, McKenna & Spatharou 2014).

2.2 Overweight and obesity

The WHO (2014) defines obesity as 'abnormal or excessive fat accumulation that may impair health'. A BMI measurement is used to determine if a person is underweight, normal weight, overweight or obese. In order to calculate BMI, the weight (in kilograms) is divided by height (in metres squared). A value of 25-29.9 kg/m^2 indicates overweight, while a value of 30 kg/m^2 indicates obesity (Stoner & Cornwall 2014). Apart from using BMI as an indicator of overweight and obesity, there are various other methods and anthropometric measurements to evaluate the condition (Rossouw, Grant & Viljoen 2012). Some of these include: clinical assessments, skinfold thickness, weight-for-age (in children less than five years old) and waist-to-hip ratio. However, BMI is the most commonly used indicator of weight status for those

over five years of age. Reference populations and cut-off points for normal, overweight and obesity are available alongside the anthropometric measurements (Rossouw *et al* 2012).

2.2.1 Background

Overweight and obesity occurs when there is abnormal or excessive fat accumulation in the body, such that it has adverse effects on the health and well-being of an individual (Rossouw *et al* 2012). Apart from NCDs, other adverse effects of overweight and obesity include joint problems, arthritis and back pain (Tugendhaft & Hofman 2014). Overweight and obesity have become a global epidemic and a major risk factor for the growing burden of NCDs, such as type 2 diabetes, hypertension and hypercholesterolaemia (Cabrera Escobar *et al* 2013). Countries with a high socioeconomic status generally had a higher prevalence of overweight and obesity. However, this has now changed as the prevalence of overweight and obesity has increased in low and middle-income countries (Cabrera Escobar *et al* 2013). Over the past three decades, there have been drastic changes in lifestyle, globalisation of food supply and urbanisation. These changes have resulted in unhealthy diets, decreased physical activity levels and an increase in BMI (Cabrera Escobar *et al* 2013). Many lifestyle change programmes have been put forth to prevent overweight and obesity, however, the epidemic continues to rise. There has now been interest in developing combined approaches to address individual behaviour. Population-oriented fiscal policies such as the SSB tax or subsidies to create healthier consumption patterns have recently received extra attention (Cabrera Escobar *et al* 2013).

2.2.2 Prevalence

According to the WHO (2014), the worldwide prevalence of obesity has almost doubled between 1980 and 2014. Obesity is regarded as one of the most serious public health challenges of the 21st century, as global statistics show that 39% of adults were overweight and 13% were obese in 2014 (WHO 2016). The mean BMI has increased by 0.4 kg/m^2 for men from 1980 to 2008, and 0.5 kg/m^2 for women (Dobbs *et al* 2014). Childhood obesity is one of the most serious public health challenges of the 21st century (WHO 2016). Global statistics from 2010, showed that 42 million children below five years of age were overweight (WHO 2016). More than 2.1 million people in the world are overweight or obese, yet obesity is preventable. Additionally, obesity is the cause of 5% of deaths worldwide. If the prevalence continues at its current trajectory, almost half the world's population will be overweight or obese by 2030 (Dobbs *et al* 2014). In Africa, 27% of adults (20 years and above) are overweight and 8% are

obese (Dobbs *et al* 2014), while the number of overweight or obese children has doubled since 1990 (Rossouw *et al* 2012).

South Africa has the 17th highest prevalence of obesity worldwide (Myers, Tugendhaft, Mandle, Myers & Hofman 2017; Seedat & Singh 2017), and the third highest in Africa (Myers *et al* 2017). It is estimated that 250 000 more South Africans will become obese within the next three years (Seedat & Singh 2017). According to the SANHANES-1, 65.1% of women and 31.2% of men were overweight or obese (Shisana *et al* 2013). The SADHS (2016), which used BMI scores to identify overweight and obesity, outlined that 68% and 31% of women and men respectively, were overweight or obese. This shows that the rate of overweight and obesity has increased for women, but remains constant for men (SADHS 2016). In 2008, the average BMI in South Africa was 26.9 kg/m² for males (compared to the world average of 23.8 kg/m²) and 29.5 kg/m² for women (compared to a world average of 21.4 kg/m²) (Cois & Day 2015). Statistics from 2008 showed that 46% and 56% of South African men and women, respectively, were classified as inactive (Nojilana, Bradshaw, Pillay-van Wyk, Msemburi, Somdyala, Joubert, Groenwald, Laubscher & Dorrington 2016).

The prevalence of obesity is increasing rapidly in low to middle-income countries (WHO 2016). The increase in obesity prevalence is highest among men of higher socio-economic status, but for women, the rate of increase is the same in all income groups (Aluba & Chola 2014). In addition, there is a large difference in obesity prevalence between rural and urban areas, with a higher prevalence in urban areas (Dobbs *et al* 2014). The SADHS (2003) showed that 27.4% of women and 8.8% of men were obese. However, the SANHANES-1 indicated that 39.2% of women and 10.6% of men were obese (Shisana *et al* 2013). This shows a substantial increase in the prevalence of obesity in South Africa. According to the SADHS (2016), South Africans remain obese, especially Africans (20%) and by race and sex, obesity is highest amongst Coloured women (26%). In addition, the study indicated that approximately one third and two thirds of men and women, respectively, were overweight or obese. In addition, 20% of women and 3% of men were severely obese (SADHS 2016). The SANHANES-1 indicated that 7.1% of girls and 4.7% of boys in South Africa were obese (Shisana *et al* 2013). The rates of obesity among children were highest in urban formal areas and lowest in informal rural areas. In South Africa, more girls are obese compared to boys, with KwaZulu-Natal having the second highest prevalence of childhood obesity in comparison to the other provinces (Shisana *et al* 2013).

2.2.3 Causes

The causes of obesity are multifactorial and include both modifiable and non-modifiable factors (Dobbs *et al* 2014). Non-modifiable factors can be viewed as being more negative, when compared to modifiable factors. This is due to the fact that modifiable factors can be adapted to produce a better health outcome. For example, one can change their dietary habits and levels of physical activity in order to lose weight (modifiable). However, one cannot change the increasing urbanisation in the country (non-modifiable) (Dobbs *et al* 2014). The number of modifiable factors influencing the development of overweight and obesity outweigh the number of non-modifiable factors. However, the impact of non-modifiable factors may be just as detrimental on overweight and obesity (Dobbs *et al* 2014). The identification of biological factors causing obesity is of significant interest to the public health sector, as knowledge can help target high risk groups more effectively, whilst avoiding a waste of resources (Cois & Day 2015).

2.2.3.1 Non-modifiable factors as a cause of overweight and obesity

Genetics is a non-modifiable factor that influences the development of overweight and obesity (Xia & Grant 2013). Genes play a role in determining BMI and, consequently, in the pathogenesis of obesity. If this factor could be adequately characterised, better obesity intervention for the future would be possible (Xia & Grant 2013). The influence of genetics on overweight and obesity is displayed in the differences in the prevalence of overweight and obesity among various ethnic groups (Xia & Grant 2013). In the past, family studies and animal models helped scientists to research the genetic aspects associated with obesity. However, efforts to identify the specific underlying genetic cause of overweight and obesity, is still on-going. This can be attributed to the complex interactions involved in the regulation of adiposity (Xia & Grant 2013). Leptin, a protein produced by fatty tissue, regulates food intake, energy balance, and body weight. It is known that leptin concentrations are positively correlated with obesity, however, it has been discovered that leptin mutations may play a central role in the development of overweight and obesity (Xia & Grant 2013).

Age is another non-modifiable factor that influences the development of overweight and obesity (Mahan *et al* 2016, p402; Steyn & Mchiza 2014). As an individual grows older, changes in hormone levels, such as increased androgens, may lead to obesity. Therefore, BMI and waist-to-hip ratio increases with age (Steyn & Mchiza 2014). In addition, muscle mass is

reduced, if not maintained (Mahan *et al* 2016, p402). This leads to a reduction in energy or kilojoule requirements and a slower metabolism. Furthermore, some elderly patients may present with arthritis, a painful condition experienced in the joints. Because of the pain experienced, patients are less likely to mobilise, increasing their chances of overweight and obesity (Mahan *et al* 2016, p402). In South Africa, gender also seems to have an influence on BMI, in that women present with a higher BMI than men (Cois & Day 2015). In addition, BMI increases more rapidly in women than men. The rate of increase in BMI is slowing down for men, but not for women. Young women in particular, are most vulnerable to increasing BMI (Cois & Day 2015).

Various medical factors may influence the development of overweight and obesity. Medications that may cause overweight and obesity include: antidepressants, anti-seizure medication, diabetes medication, antipsychotics, steroids and beta-blockers (Domecq, Prutsky, Leppin, Sonbol, Altayar, Undavalli, Wang, Elraiyah, Brito, Muack, Lababidi, Prokop, Asi, Wei, Fidahussein, Montori & Murad 2015). Medical conditions that may result in overweight and obesity include: hypothyroidism (abnormally low activity of the thyroid gland, therefore, reduced thyroid hormones), Cushing's syndrome (the over-production of corticosteroid hormones), Prader-Willi syndrome (a genetic disorder leading to an uncontrolled appetite) (Mahan *et al* 2016, p402) and depression (feelings of severe dejection which leads to uncontrolled eating habits) (Steyn & Mchiza 2014).

Urbanisation in South Africa has been increasing steadily since 1975 and is governed by political and technological aspects (Steyn & Mchiza 2014). These include globalisation, governance, aggressive marketing, flexible trade policies and the negative impact of the food industry (Steyn & Mchiza 2014). This has greatly impacted the prevalence of obesity in the country as people are always looking for cheap, affordable, convenient and palatable meal options. These people include those with a high socioeconomic status and higher levels of education, who tend to adopt new dietary patterns (Steyn & Mchiza 2014). There has been a massive growth in the food industry, especially with fast foods and SSBs, to accommodate these needs. Although these products are expensive in relation to the average South African income and have poor nutritional value (high energy and sugar content), their sales are still increasing (Steyn & Mchiza 2014). This is because preference for food is shaped by taste and brand image (Myers *et al* 2017). There has been a large expansion in supermarket locations across South Africa, which contributes to the fact that only 40% of South Africans consume

the recommended daily amount of energy (Myers *et al* 2017). New technologies enable companies to gather data on consumer preferences, which is then used to market aggressively, based on demographic characteristics. Unhealthy products are strategically placed in supermarkets to ensure that the most profitable products are at eye-level and easily accessible (Steyn & Mchiza 2014). In addition, the nutrition transition has distorted indigenous and traditional food habits. This is because the population has turned to convenient, cheaper and unhealthier meal options, as opposed to enduring the lengthy preparation of staple, indigenous and traditional foods (Steyn & Mchiza 2014).

One of South Africa's biggest challenges is the issue of crime. Unsafe conditions mean that people are reluctant to leave their homes to partake in outdoor activities in their neighbourhood (Steyn & Mchiza 2014). Although gyms are available for physical activity, they are unaffordable for most South Africans. In addition, access to facilities such as gyms or parks may be difficult to aquire, due to the lack of transportation and money (Steyn & Mchiza 2014). The issue of health care services is an additional South African challenge. Health education, social assistance and medical treatment are not always executed, as well as it may be in certain developed countries. There is a lack of human resources available to convey these services as well as decreased monitoring and support by the government (Steyn & Mchiza 2014).

The extremes in income distribution in South Africa influences the prevalence of obesity. Those with a higher socio-economic status are able to afford private health care, gyms and healthy, nutritious food. However, they are at a higher risk for obesity (Cois & Day 2015; Steyn & Mchiza 2014). Those with tertiary education, which is also an indicator of high socio-economic status, also show higher rates of obesity (Cois & Day 2015; Steyn & Mchiza 2014). Although income and education are partially modifiable factors, the South African economy makes it quite difficult for certain individuals to change their income/education status (Cois & Day 2015). The population residing in rural areas of South Africa present with lower BMI than urban areas. However, rural areas are catching up, possibly due to the rapid spread of urban lifestyles into rural areas, which includes increased consumption of processed foods and decreased physical activity (Cois & Day 2015).

2.2.3.2 Modifiable factors as a cause of overweight and obesity

It is crucial that modifiable risk factors for obesity are identified, in order to prevent lifelong morbidity from obesity (Lu, Xun, Wan, He & Cai 2016). In the 21st century, people are independently making their own food and eating decisions (Mahan *et al* 2016, p402), and the nutrition transition plays an important role in this (Steyn & Mchiza 2014). The nutrition transition is the term used to describe the shifts in dietary patterns that have occurred over time. These changes are associated with unhealthy eating habits, decreased energy expenditure and inadequate micronutrient intake (Steyn & Mchiza 2014). Therefore, nutrient-rich foods are being replaced with nutrient-poor, energy-dense food items in the modern world (Mahan *et al* 2016, p402). Additionally, the nutrition transition is associated with increased alcohol and tobacco use and a stressful lifestyle (Cois & Day 2015; Steyn & Mchiza 2014). As a result of the nutrition transition, people are choosing a Western diet over the traditional, typical diet eaten by the population over many generations. Adequate dietary guidance from health professionals is required to prevent this from having a negative effect on health (Steyn & Mchiza 2014).

Multiple modifiable factors influence the development of excess energy intake. For example, food establishments offer take-away foods at an affordable price. Eating away from home therefore becomes convenient and cheap. Furthermore, fast food establishments are serving larger portion sizes (Mahan *et al* 2016, p402; Steyn & Mchiza 2014). In South Africa, there are a number of informal vendors, usually in poorer areas, who sell energy-dense foods made with large amounts of fat, salt, sugar and/or refined carbohydrates (Manning, Senekal & Harbron 2016; Steyn & Mchiza 2014). Low income earners are vulnerable to purchasing cheap vegetable oils and other fats (Steyn & Mchiza 2014). Food has shifted from becoming a means of vital nourishment to a means of pleasure. Although these factors may seem unmodifiable because of urbanisation, it is up to the individual to make educated, informed decisions about their health (Mahan *et al* 2016, p402). Healthy food choices are affected by cost, preference, access, cultural acceptance, knowledge and perceived control (Manning *et al* 2016). People often resort to convenience foods because they have limited time available to prepare fresh, healthy meals (Mahan *et al* 2016, p402). This leads to unhealthy snacking and sometimes, more frequently than ideal. Unhealthy snacking and/or uncontrolled eating often occur in front of the television. Eating family meals in front of the television rather than at the dinner table is an unhealthy habit, which promotes obesity (Mahan *et al* 2016, p402).

An independent risk factor for the development of obesity is the consumption of SSBs (Cois & Day 2015; Steyn & Mchiza 2014; Keller, Kirzner, Pietrobelli, St-Onge & Faith 2009). The human body is often unable to compensate for the energy consumed from these highly palatable liquid kilojoules. Due to the increased energy intake and reduced compensation of the sugar-sweetened beverages, people consuming these tend to have a poor quality diet and are ultimately at risk for obesity. In addition, it has been found that a high consumption of sweetened beverages reduces the intake of milk and calcium among children. Furthermore, there is a positive correlation between age and the amount of sweetened beverages consumed by children (Keller *et al* 2009).

Another factor contributing to the rising rates of obesity, is the steady decline in physical activity, globally (Mahan *et al* 2016, p402). Modern technology has promoted a sedentary lifestyle with many hours being spent watching television or playing computer games. In addition, an increased length of time spent watching television leads to the frequent consumption of unhealthy snacks (Steyn & Mchiza 2014). In South Africa, most parents are concerned about the safety of their children, and would prefer them to be indoors, rather than playing outside. In some cases, there are fewer opportunities for physical activity. Many schools do not have access to sport facilities and many areas of South Africa do not have safe parks or sports fields. Again, these factors may seem unmodifiable due to high South African crime rates as well as the lack of recreational facilities; however, it is up to the government to make positive changes, to ensure better health and wellbeing for its nation (Mahan *et al* 2016, p402). Transportation has also limited the opportunity for the public to walk to shops or schools (Mahan *et al* 2016, p402). Decreased participation in sports at school is particularly prevalent amongst girls, with the decision being supported by parents. Due to this, overweight children are likely to have overweight parents (Dehghan, Akhtar-Danesh & Merchant 2005). In South Africa, parents of obese children are usually well-educated with a high socioeconomic status (Steyn & Mchiza 2014).

In South Africa, there is a belief among certain cultures that being obese is more desirable than being slim (Talbot & Pienaar 2012). In the Zulu culture, obesity is thought to be a sign of wealth, health, prosperity and affluence and is therefore more desirable to the opposite sex (Okop, Mukumbang, Mathole, Levitt & Puoane 2015; Devanathan, Esterhuizen & Govender 2013; Talbot & Pienaar 2012). In addition, losing weight has negative connotations for certain cultures, as this could lead to others assuming that they are infected with the human immunodeficiency virus (HIV). Culture creates distorted perceptions of obesity, which poses

a challenge for health care workers. Additionally, cultural beliefs are not easy to dismiss (Okop *et al* 2015; Devanathan *et al* 2013; Talbot & Pienaar 2012).

Nutrition education has an important role to play in maternal health (Steyn & Mchiza 2014). It is important that women make healthy changes to their diet while they are pregnant. This ensures that the risk of NCDs is reduced in later life for that infant. Pregnancy is a critical window period when the fetus is most susceptible to nutrition exposure. A measurable outcome can be seen as there is a dose-response relationship between exposure and outcome (Steyn & Mchiza 2014). In addition, factors such as maternal obesity, gestational weight gain and gestational diabetes can be used to determine the nutritional outcome of the infant. Exclusive breastfeeding has the potential to decrease the risk for obesity and NCDs for the infant during adulthood (Steyn & Mchiza 2014).

2.2.4 Health consequences

Obesity has consequences on the health and well-being of an individual (Tugendhaft & Hofman 2014). The consequences of obesity may include NCDs such as type 2 diabetes, hypertension, cancer, CVD, sleep apnoea, abnormal lipids and fatty liver disease (WHO 2014). Non-communicable diseases can shorten lifespan and affect the quality of life due to increased risk for stroke, blindness, amputations and kidney failure. These deaths and disabilities result in major financial strain on individuals, families, government and employers (Tugendhaft & Hofman 2014). Health care costs, decreased productivity and life insurance are some examples of the costs that may increase as a result of being obese (Tugendhaft & Hofman 2014). In addition to NCDs and financial strain as a consequence of obesity, there are also psychological consequences (Mahan *et al* 2016, p402). Obese people tend to have a low self-esteem and are sometimes bullied by peers, colleagues or family members (Mahan *et al* 2016, p402).

2.2.4.1 Non-communicable diseases and morbidity

According to the WHO, NCD-related deaths are increasing globally and account for 60% of all deaths (Nojilana *et al* 2016). Between 2010 and 2013, the number of deaths caused by NCDs increased by 15% worldwide. The rate of increase has been most rapid in Africa, South-East Asia and the Eastern Mediterranean regions (Steyn & Mchiza 2014). According to the WHO, NCDs will be the biggest cause of death in South Africa by 2030. In 2010, NCDs caused 39% of the total deaths in South Africa. A third of these deaths occurred in those less than 65 years old, 14.7% in those less than 45 years old and 21.5% in those between 45 and 59

years old (Nolijana *et al* 2016). In addition, 4% of South Africans have multi-morbidities, which is the co-existence of two or more NCDs at the same time (Steyn & Mchiza 2014).

The total number of deaths due to NCDs in South Africa was similar to the total number of deaths which occurred due to HIV and acquired immune deficiency syndrome (AIDS), and tuberculosis (TB) combined (Nojilana *et al* 2016). According to Manning *et al* (2016), the HIV epidemic, which is currently the leading cause of premature death in South Africa, will be surpassed by NCDs over the next few decades. This trend will have a negative impact on economic development as it will immobilise a large proportion of the working-age population (Manning *et al* 2016). The South African government has recognised the need to address NCDs, and has developed a strategic plan to decrease mortality from NCDs by 25%, within a decade (Nojilana *et al* 2016). This plan includes population-based strategies as well as individual-based strategies and will engage various sectors such as agriculture, education, sports, trade, industry and arts and culture (Nojilana *et al* 2016). The prevention and delay of the increasing NCD prevalence is more effective and less costly than treating those with NCDs (Nojilana *et al* 2016).

High-income countries are now seeing fewer NCDs compared to low to middle-income countries (Nojilana *et al* 2016). This is because there is less smoking and unhealthy diets, increased physical activity, reduced alcohol consumption and more treatment available. In low to middle income countries such as South Africa, the prevalence of NCDs is highest among low income earners with a decreased level of education (Nojilana *et al* 2016). Therefore, a great effort is needed in order to restructure primary health care and district health services, to increase the standard of care. In addition, the government needs to find a strategy to cope with the growing population and increasing burden of disease. Furthermore, medication distribution, policy development, health promotion and behavioral counselling are issues which require more time and effort from the government (Manning *et al* 2016).

In addition, there are many differences among population groups which are driven by socioeconomic differences (Nojilana *et al* 2016). These inequalities affect the poorer population negatively, in terms of NCDs. To further elaborate, the poor have decreased access to healthcare, including screening, diagnosis and treatment. Therefore, many remain undiagnosed and untreated resulting in a higher risk for preventable complications. The poorer population also face increased suffering due to the lack of health insurance (Nojilana *et al* 2016).

In South Africa, urbanisation has led to unhealthy lifestyle changes and hence, obesity and NCDs (Manning *et al* 2016; Nojilana *et al* 2016). Manning *et al* (2016) define the top three risk factors for the development of NCDs as being: a lack of physical activity, low fruit and vegetable intake and increased blood pressure. A diet high in refined carbohydrates, low in fibre and high in energy, sodium, saturated fat and sugar, increases the risk for NCDs (Steyn & Mchiza 2014). In addition, socio-economic, cultural, political and environmental determinants influence the development of NCDs (Manning *et al* 2016).

An independent risk factor for the development of NCDs is the consumption of SSBs (Steyn & Mchiza 2014). The frequent consumption of SSBs can lead to the development of albuminuria, a marker of early kidney damage (Hu & Malik 2010). It can also lead to the formation of kidney stones, gallstones and an increased risk for chronic kidney disease. Kidney disease and gallstones are a risk for the development of CVD (Hu & Malik 2010). Apart from NCDs, an excessive intake of SSBs can cause hyperuricemia and gout. This can cause inflammatory arthritis arising from the deposition of uric acid in the cartilage (Hu & Malik 2010).

Type 2 diabetes mellitus

Type 2 diabetes mellitus is characterised by high blood sugar levels and insulin resistance. It is a long-term metabolic disorder which is caused by genetics and/or obesity (Manyema, Veerman, Chola, Tugendhaft, Labadarios & Hofman 2015). On the other hand, type 1 diabetes mellitus, previously referred to as insulin dependent diabetes, occurs when the pancreas produces little or no insulin (Manyema *et al* 2015). The complications associated with uncontrolled diabetes mellitus include amputations, blindness, kidney failure, neuropathy, nephropathy, retinopathy and death (Seedat & Singh 2017).

The prevalence of diabetes mellitus is increasing globally. In 1980, there were 108 million people living with diabetes mellitus and by 2010, there were 422 million (WHO 2016). The prevalence of diabetes has increased in South Africa from 5.5% in 2000, to 9% in 2009 (Manyema *et al* 2015). Worldwide, 2% of all deaths were due to diabetes mellitus in 2005. However, the number of deaths due to diabetes mellitus is expected to double by 2035 (Manyema *et al* 2015). According to Cois (2016), the average number of South African diabetes mellitus cases in 2016/17 was 1.7 cases per 1000 people. KwaZulu-Natal had an average of 2.2 cases of diabetes mellitus per 100 people, making it the province with the second highest prevalence of diabetes mellitus. In terms of district comparison, UMgungundlovu had

the highest average of 4.02 cases per 1000 people (Cois 2016). In addition, it was estimated that there were 2000 diabetes-related amputations and 8000 blindness cases, due to diabetes annually in South Africa (Myers *et al* 2017; Manyema *et al* 2015). Moreover, 76% of diabetes deaths in South Africa occurred in those less than 60 years old, which is the most economically active population. Finally, health expenses due to diabetes mellitus in South Africa are expected to double between 2010 and 2030 (Manyema *et al* 2015).

Research suggests that SSB consumption is a risk factor for the development of diabetes mellitus (Manyema *et al* 2015). This is because SSBs cause obesity, resulting from increased adiposity. The sugar from SSBs is rapidly absorbable with a high glycaemic index. This results in inflammation, impaired *beta* cell function and insulin resistance, which together, lead to diabetes mellitus (Manyema *et al* 2015). According to Manyema *et al* (2015), if two or more SSBs are consumed per day, the risk of developing diabetes mellitus increases by 24%. It is estimated that a South African SSB tax of 20% could reduce the prevalence of diabetes mellitus by 106 000 among women and 54 000 among men, over the next 20 years. The outcome would be a 4% reduction in the prevalence of diabetes mellitus (Manyema *et al* 2015). Furthermore, the impact of the SSB tax on diabetes mellitus would be greatest on women, as they have a higher BMI then males. In addition, more than 21 000 deaths could be averted and the SSB tax could save more than R10 billion in health care costs, after 20 years of the SSB tax being implemented (Manyema *et al* 2015).

Liquid versus solid forms of energy from sugar, affects metabolic diseases differently (Hu & Malik 2010). Fructose from SSBs is absorbed quicker than fructose from whole fruits, which are absorbed more slowly due to presence of fibre. Hence, the rapidly absorbed liquid fructose causes a spike in blood sugar levels and insulin levels. In addition, there is an increased rate of hepatic extraction, hence, increased production of lipids (Hu & Malik 2010). Furthermore, high glycaemic index foods such as SSBs stimulate appetite and promote weight gain due to increased post-prandial insulin responses, following intake. This promotes insulin resistance and exacerbates inflammation, causing diabetes mellitus (Hu & Malik 2010). Sugar intake is therefore a significantly statistical determinant of the diabetes mellitus prevalence, and obesity exacerbates the situation (Basu, Yoffe, Hills & Lustig 2013).

According to Hu (2013), 80% of those with diabetes mellitus live in low or middle-income countries, which have public health and economic consequences. The prevalence of diabetes mellitus in South Africa is above the global average prevalence of 10% (WHO 2017). In

addition, half of the South African diabetes mellitus cases in 2013 were undiagnosed (Manyema *et al* 2015). This may be due to poor control of the disease and poor accessibility of early screening. Societal factors such as urbanisation and a sedentary lifestyle are also associated with the development of diabetes mellitus in low to middle-income countries (Basu *et al* 2013). Therefore, the South Africa SSB tax may have a role to play in preventing diabetes mellitus, in those who are most at risk (Manyema *et al* 2015).

Cardiovascular disease

Cardiovascular disease occurs when blood vessels become narrowed due to aging, genetics, an unhealthy diet and sedentary lifestyles, and is the number one cause of death globally (Nojilana *et al* 2016). Behavioral risk factors are responsible for 80% of CVD incidents (Steyn & Mchiza 2014). Approximately 31% of global deaths were attributed to CVDs in 2015 (WHO 2017; Nojilana *et al* 2016). Over the past 20 years, the prevalence of CVD has increased 10 fold in sub-Saharan Africa (Steyn & Mchiza 2014). In 2010, 44% of NCD-related deaths in South Africa were attributed to CVD (Nojilana *et al* 2016). In 2012, it was estimated that premature employee deaths from CVD resulted in a loss of R15 billion and 132 million workdays per annum in South Africa (Tugendhaft & Hofman 2014).

Cerebrovascular disease is the leading CVD causing death in South Africa (Nojilana *et al* 2016). Globally, it accounted for 5.1% and 8.6% of total male and female deaths, respectively, in 2010. The number of deaths resulting from stroke over the same time period was similar for males and females (approximately 114 out of 100 000 people) (Nojilana *et al* 2016). In addition, stroke was the second leading cause of death in South Africa, after HIV/AIDS. Male death rates from ischemic heart disease were 1.8 times higher than for females in 2010 (Nojilana *et al* 2016). It is expected that mortality from heart disease will increase by 74% in African women and by 70% in African men, by 2030 (Steyn & Mchiza 2014). According to Nojilana *et al* (2016), the Indian population in South Africa is more prone to heart disease compared to other race groups. This can be attributed to genetics and dietary practices of the Indian population (Nojilana *et al* 2016). For example, the SANHANES-1 indicated that the Indian population had the highest self-reported family history of high blood pressure (46.8%), heart disease (28.8%) and high blood glucose (49.0%) (Shisana *et al* 2013).

Hypertension is diagnosed when blood pressure is greater than or equal to 140/90 mmHg (systolic/diastolic) (Cois 2016). The prevalence of hypertension among South African adults is higher than the prevalence of hypertension in other sub-Saharan African countries. However,

treatment coverage has increased substantially over the last few years (Cois 2016). With this being said, the predicted further spread of urbanisation in rural areas is bound to increase the prevalence of hypertension in South Africa (Cois 2016). In 2008, 43% and 41% of South African men and women, respectively, presented with high blood pressure (Nojilana *et al* 2016). In 2015, 28.2% of South Africans were hypertensive, however; there were large variations across the provinces. In KwaZulu-Natal, 25.2% of the population were hypertensive, with the highest prevalence in the Northern Cape (40.1%) and the lowest in Limpopo (21.4%) (Cois 2016). There is a well-established relationship between age and blood pressure. As age increases, so does blood pressure (Cois 2016). The difference in hypertension prevalence between the provinces was largely due to differences in the age distribution of the populations (Cois 2016).

The consumption of SSBs leads to CVD due to its caloric effects and ability to induce weight gain (Hu & Malik 2010). In addition, SSB consumption can independently lead to CVD through non-caloric-related metabolic effects of constituent sugars. This is due to the SSB effects on inflammation, which influences atherosclerosis, plaque stability and thrombosis. Sugar-sweetened beverages stimulate the inflammatory response through hyperglycemia, which activates the electron transport chain to produce superoxide radicals (Hu & Malik 2010). Therefore, SSB consumption increases the risk of CVD by contributing to the development of hypertension, dyslipidaemia, inflammation, coronary heart disease and stroke. According to Benade & Essop (2017), the sugar content of SSBs triggers perturbations, leading to downstream metabolic and functional effects. This affects the liver and adipose tissue depots, leading to alterations in circulating blood metabolites (e.g. leptin/ uric acid), thus resulting in CVD. According to Xi, Huang, Reilly, Li, Zheng, Barrio-Lopez, Martinez-Gonzalez & Zhou (2015), it is the fructose component of SSBs that specifically contributes to CVD. Fructose increases serum uric acid concentration leading to the activation of the rennin-angiotensin system. Consequently, acute endothelial dysfunction, renal microvascular alteration and chronic sodium retention occurs, leading to hypertension. In addition, fructose increases insulin resistance, fat stores and triglyceride concentrations. Fructose also decreases high-density lipoprotein (HDL) and endothelial nitrous oxide production, all of which contribute to the pathogenesis of CVD (Xi *et al* 2015).

According to the Canadian Heart and Stroke Foundation (2014), consuming more than, or equal to 10% of total energy from added sugar (but less than 25%), increases risk of death from CVD, compared to those who consume less than 10%. The risk is tripled for those who consume

more than or equal to 25% of total energy from added sugar. Women who consume four or more servings of SSBs have a 44% increased risk for developing hypertension (Hu 2013). According to Hu & Malik (2010), two or more servings of SSBs a day results in a 35% increased risk for coronary heart disease. In addition, one or more servings of SSBs a day results in a 16% increased risk for stroke (Hu & Malik 2010).

Hypercholesterolaemia

Hypercholesterolaemia is defined as a condition whereby there is excess cholesterol in the blood, which may lead to an increased risk for heart disease and stroke (Nojilana *et al* 2016). In 2018, 31% of men and 37% of women in South Africa were living with elevated cholesterol levels (Nojilana *et al* 2016). According to the SANHANES-1, the mean serum total cholesterol, HDL cholesterol, low-density lipoprotein (LDL) cholesterol and mean serum triglyceride concentrations for males were; 4.21 mmol/L, 1.22 mmol/L, 2.44 mmol/L and 1.44 mmol/L, respectively (Shisana *et al* 2013). Total cholesterol, LDL-cholesterol and triglyceride concentrations increased with age. The Western Cape Province had the highest serum total cholesterol and LDL-cholesterol concentrations, compared to the other provinces in South Africa. However, the Northern Cape population had the highest triglyceride concentrations (Shisana *et al* 2013).

According to Hu (2013), the daily consumption of SSBs can result in a 22% increased risk for hypertriglyceridaemia and hypercholesterolaemia. This is due to the fact that SSBs are associated with the production of LDL-cholesterol and excess fat in the liver. Sugar-sweetened beverages promote the accumulation of visceral adipose tissue and the deposition of ectopic fat. In addition, the consumption of SSBs increases *de novo* lipogenesis and visceral adiposity, which promotes dyslipidaemia. A high intake of SSBs results in large amounts of fat in the liver, as well as increased visceral fat, muscle fat and triglyceride concentrations (Hu & Malik 2010).

Cancer

Cancer is defined as a condition with uncontrolled division of abnormal cells in the body (Nojilana *et al* 2016). The intake of SSBs has been demonstrated to have a positive association with obesity, NCDs, as well as some cancers (Tseng, Lin, Griffiths, Cornwell & Sothern 2016; Nojilana *et al* 2016). In 2010, 18% of NCD-related deaths in South Africa were due to cancer

(Nojilana *et al* 2016). In addition, the cancer death rate for the Coloured population was 1.8 times greater than for the African population. With this being said, there is a lack of national cancer incidence data (Nojilana *et al* 2016).

Cancer survival rates increase with improvements in treatment and health care. Research regarding SSB consumption among cancer patients could assist with this (Tseng *et al* 2016). Thus far, obesity has been independently associated with a range of cancer types, such as liver, prostate, colon and endometrial. However, evidence which states how SSB consumption affects the risk for cancer, is limited and unclear (Tseng *et al* 2016). Diets containing large amounts of added sugar and refined carbohydrates increase the risk for colon cancer through their impact on plasma glucose levels (Tseng *et al* 2016). A high dietary intake of sugar and SSBs was associated with an increased risk for type 1 endometrial cancer. However, the consumption of SSBs was not associated with overall risk for pancreatic cancer and ovarian cancer (Tseng *et al* 2016). Additionally, cancer survivors tend to have a lower overall dietary intake of added sugars and SSBs (Tseng *et al* 2016). Given the current evidence, the impact of SSB consumption on cancer risk may vary by type of cancer. More research is required on the association between cancer risk and SSB intake. Currently, there is minimal existing research which examines the effect of SSB intake in cancer patients or cancer survivors (Tseng *et al* 2016).

Chronic respiratory disease

Chronic respiratory disease is a condition where there is long-term breathing problems and obstruction of the air flow in the body (Poulain, Doucet, Major, Drapeau, Sèriés, Boulet, Tremblay & Maltais 2006). According to Poulain *et al* (2006), the link between obesity and chronic respiratory diseases was identified in 2006. According to Phaswana, Govuzela, Thsehla & de Villiers (2017), chronic respiratory diseases are among the leading causes of death worldwide. In addition, its prevalence is expected to rise in low- and middle-income countries. In South Africa, the most common chronic respiratory diseases are COPD (chronic obstructive pulmonary disease) and asthma (Phaswana *et al* 2017). Of all the NCD-related deaths in South Africa in 2010, 9.3% were due to chronic respiratory disease (Nojilana *et al* 2016). In addition, 48 out of 100 000 males in 2010 had COPD, and the rate was doubled for females (Nojilana *et al* 2016).

Patients presenting with both obesity and chronic respiratory disease, present a challenge to health care workers (Poulain *et al* 2006). This is because strict monitoring is required for obese patients who exercise with breathing difficulties. Obesity may be causally linked to obstructive sleep apnoea and obesity hypoventilation syndrome (Poulain *et al* 2006). Obesity is also associated with COPD and asthma, although the nature of this association has not been fully elucidated (Phaswana *et al* 2017). The effects of obesity on respiratory function are linked to the magnitude of obesity and the presence of abdominal fat (Poulain *et al* 2006). Obesity impairs ventilatory function due to the accumulation of fat tissue (Phaswana *et al* 2017; Poulain *et al* 2006). A high BMI leads to a reduction in forced expiratory volume, forced vital capacity, total lung capacity, functional residual capacity and expiratory reserve volume. In addition, respiratory muscle strength may be compromised in obesity and may weaken (Poulain *et al* 2006). This is due to decreased chest wall compliance or lower operating lung volumes, or both. Not surprisingly, exercise capacity is often impaired in obese patients (Poulain *et al* 2006).

A causal relationship may explain the parallel increases in the prevalence of obesity and asthma (Poulain *et al* 2006). Weight reduction is recommended for obese patients diagnosed with chronic respiratory disease (Poulain *et al* 2006). These patients should focus on a healthy diet, adequate levels of physical activity and taking their medication. Patients with chronic respiratory disease often fail to increase their levels of physical activity because they are generally inactive. Thus, the incorporation of pulmonary rehabilitation and exercise training strategies may assist these patients with initiating exercise (Poulain *et al* 2006).

2.2.5 Psychological consequences

Apart from physical health being affected by overweight and obesity, psychological health is also affected (Mahan *et al* 2016, p402; Agrawal, Gupta, Mishra & Agrawal 2015). The difficulties experienced include body dissatisfaction, decreased self-esteem, depression, discrimination from others and decreased socialisation (Mahan *et al* 2016, p402; Agrawal *et al* 2015). Minimal attention and research has focused on the negative psychological consequences of overweight and obesity. Body dissatisfaction is most prevalent among overweight and obese children, particularly girls (Harriger & Thompson 2012).

Self-esteem is reduced due to weight-related teasing from peers, criticism by parents and external control beliefs (children who believe that their weight is beyond their control).

Therefore, it is not weight status that reduces self-esteem, but rather the societal factors (Rankin, Matthews, Cobley, Han, Sanders, Wiltshire & Baker 2016; Agrawal *et al* 2015; Harriger & Thompson 2012). Overweight and obese individuals may experience negative psychological consequences from as early as the pre-school years, when the issue of 'body image' becomes a part of their knowledge (Rankin *et al* 2016). Body image is defined as 'an individual's subjective evaluation of his/her own appearance' (Harriger & Thompson 2012). Once an individual is dissatisfied with their body image, this may ultimately lead to unhealthy eating behaviour such as skipping meals, fasting, self-induced vomiting, binging and use of diet pills or laxatives. In addition, body dissatisfaction leads to depression and suicidal thoughts (Agrawal *et al* 2015; Harriger & Thompson 2012).

Weight stigmatisation is defined as 'negative weight-related attitudes and beliefs that are manifested through stereotypes, bias and prejudice towards an overweight or obese individual' (Harriger & Thompson 2012). Therefore, weight stigmatisation leads to rejection based on the weight class of a person. Weight stigmatisation leads to social marginalisation (defined as 'social exclusion of peers as a result of viewing them as undesirable or different'), where overweight and obese individuals may sometimes be treated differently to their 'normal weight' peers (Rankin *et al* 2016). Although parents and educators endorse negative stereotypes among the youth, this should be corrected in order to avoid the negative impact of psychological consequences among overweight and obese individuals (Harriger & Thompson 2012).

There is a need for interventions to support overweight and obese individuals who experience teasing and/or bullying. This could assist in targeting the negative stereotypes in society (in relation to weight class), and providing simple medical information to children with regards to overweight and obesity (Rankin *et al* 2016; Harriger & Thompson 2012). It should be emphasised that society should not blame individuals for their weight, and parents/educators should not force children to partake in physical activity that they do not find desirable. Emphasis should rather be placed on healthy eating, promotion of physical activity, reduced stigmatisation and teasing in society, and the promotion of body acceptance. In addition, there is a need to educate families, health care workers and schools that weight discrimination is a serious issue among society (Harriger & Thompson 2012).

2.2.6 Economic consequences

Globally, obesity costs 2.0 trillion dollars, or 2.8% of the world's gross domestic profit (GDP) (Dobbs *et al* 2014). Although the WHO recommends that 5% of the GDP should be spent on health care, South Africa spends 8.9% (Seedat & Singh 2017). This expenditure is expected to rise over the next few years. In South Africa, R29 billion was lost between 2009 and 2015 due to NCDs (Seedat & Singh 2017). According to Manyema *et al* (2015), obesity and severe obesity is associated with an increase in health care costs, by 11% and 23%, respectively. These costs include direct and indirect costs. Direct costs include hospital fees, medication purchases and disability grants. Indirect costs may include work absenteeism; time spent caring for ill family members and reduced productivity (Manyema *et al* 2015).

Obesity has a negative effect on the South African health care economy (Seedat & Singh 2017). South Africa is already burdened with the epidemic of HIV and its costs. Now, obesity and its consequences have also become a burden on the system (Seedat & Singh 2017). With this being said, it would be beneficial for the government to invest in health care in order to reduce the burden of disease and stimulate economic development. Economic development will further increase the ability to invest in health (Manyema *et al* 2015). When a country is too poor to invest in health care, the burden of disease tends to increase. Therefore, poverty and disease worsens. An SSB tax can help, along with other obesity-preventative measures, to reduce obesity and its costs. In addition, this could contribute to economic growth (Manyema *et al* 2015). According to Myers *et al* (2017), South Africa is one of the most unequal societies in the world. The poor cannot afford quality health care and die prematurely from NCDs. As a result of NCDs, a 'poverty spiral' is created, where poor health reduces the capacity of the labour force. This in turn decreases economic growth and exacerbates the original challenges of poverty and inequality (Myers *et al* 2017).

Obesity also has a negative effect on the workplace (Manyema *et al* 2015; Tugendhaft & Hofman 2014). An obese individual may struggle to work efficiently and effectively, leading to reduced productivity. In most cases, they may need to take sick leave when they cannot cope. In South Africa, over R20 billion is lost due to absenteeism in the workplace (Tugendhaft & Hofman 2014). Additionally, obese employees cost their companies 50% more in unpaid absence from work, than their non-obese colleagues. If the obese individual becomes extremely ill or disabled due to NCDs and/or obesity and is unable to work any longer, this results in an increased turnover of employees (Tugendhaft & Hofman 2014). In some cases,

the employer may have used resources to train the individual. This would cost the employer double the training resources if another candidate were to be employed (Tugendhaft & Hofman 2014). Moreover, there are negative consequences for obese employees in the workplace, such as discrimination. At times, they may receive low salaries and are less likely to be selected for the position they applied for (Agrawal *et al* 2015; Tugendhaft & Hofman 2014). Furthermore, life insurance companies tend to increase premiums for obese clients, which impact the employer and employee (Tugendhaft & Hofman 2014).

2.2.7 Prevention

Prevention is the key strategy to controlling the obesity epidemic (Dehghan *et al* 2005). The food environment has changed substantially over the past decades. Food has become cheap, accessible, acceptable and highly palatable (Hashem & Rosborough 2017). In addition, it is heavily promoted and marketed. As a result, people are consuming foods which are high in fat, salt and sugar, but low in fibre. With this being said, the environmental drivers of poor diet quality have become too big to tackle, using nutrition education alone (Hashem & Rosborough 2017). According to Dobbs *et al* (2014), there is no single solution to create a sufficient impact in order to reverse obesity. However, a comprehensive and systematic program of multiple interventions is needed for effectiveness. Each intervention on its own is likely to contribute towards the larger solution of combatting obesity. For these interventions to be successful, engagement from a variety of sectors is needed to ensure its sustainability. These include government, retail, consumer goods companies, restaurants, employers, media organisations, educators, health care providers and individuals (Dobbs *et al* 2014).

2.2.7.1 Personal obesity-preventative strategies

An increasing concern for obesity as a national health issue, without support from government, has been raised by Donaldson, Cohen, Rutkow, Villanti, Kanarek & Barry (2014). This is largely due to perceptions that obesity is an individual's responsibility. Many respondents believed that individuals should be responsible for solutions to combat obesity as obesity is associated with a lack of willpower (Donaldson *et al* 2014). According to Dobbs *et al* (2014), personal obesity-preventative strategies need to rely less on conscious choices by individuals and their responsibility, but more on changes to the environment and societal norms. This means that healthy eating behaviour would become easier and more 'normal' (Dobbs *et al* 2014). The goals for an obese individual would be to decrease the rate of weight gain, maintain their body weight (once the target weight has been reached) and gradually reduce weight by

0.5-1 kg a week (Mahan *et al* 2016, p402). Changes in behaviour, diet and physical activity has always been the main focus, as personal obesity-preventative strategies for weight loss (Manning *et al* 2016). However, with the increasing prevalence of obesity, the impact of these strategies is questionable (Dehghan *et al* 2005).

There are many opportunities to prevent obesity on a personal level, with more interventions available to prevent obesity in children, compared to adults (Dehghan *et al* 2005). Opportunities to prevent obesity should begin in childhood, where it can be found at school, after-care or preschools. Physical activity at these levels should be promoted and healthy eating habits should be instilled (Dehghan *et al* 2005). Losing weight as an adult is difficult, as once the weight has been established, it is not easy to reduce. Therefore, it makes sense to prevent and treat obesity in children, in order to prevent them from becoming obese adults (Dehghan *et al* 2005).

Caregivers and family can greatly influence the lifestyle choices and behaviours of children (Mahan *et al* 2016, p403). The personal obesity-preventative strategies that could be implemented in the home environment, include; eating dinner at the table and not in front of the television, avoid skipping breakfast and encouraging healthy snacking. Although parents should monitor what their children eat, too much control over a child's eating behaviour should be avoided. Psychologically, this could result in children being unable to self-regulate. They are also more likely to overeat when the opportunity arises (Mahan *et al* 2016, p403). Parents should be encouraged to keep a close eye on the number of hours spent by their children watching television and playing video games (Dehghan *et al* 2005). Furthermore, snacking in front of the television and physical inactivity may be reduced while doing so (Manning *et al* 2016; Dehghan *et al* 2005). Children adhere better to a healthy lifestyle when they are not forced to exercise and reduce their dietary intake (Mahan *et al* 2016, p402). These changes should modify the food and activity behaviours of the entire family, and not just that of the obese child (Mahan *et al* 2016, p402).

According to the WHO (2015), the intake of free sugars (including added sugars) should be reduced to less than 10% of total energy intake in adults and children. For further health benefits, free sugar intake should be reduced to no more than 5% of total energy intake (ADSA 2017). South Africa has a food based dietary guideline (FBDG) which addresses sugar intake. It states: 'use sugar and foods and drinks high in sugar sparingly' (ADSA 2017). To reduce sugar intake, the sugar content in a recipe can be reduced when baking and water should be

chosen rather than SSBs when purchasing beverages (Canadian Heart and Stroke Foundation 2014). In addition, citizens can work with organisations to influence the government and food industry to reduce the sugar content in foods and drinks (Canadian Heart and Stroke Foundation 2014).

When cooking a meal, fresh/staple ingredients should be used, rather than processed or ready-to-eat foods. According to the South African FBDGs, five portions of fruit and vegetables should be eaten per day (ADSA 2017). When eating out, choose restaurants that cook healthily and provide nutritional information (Canadian Heart and Stroke Foundation 2014). When shopping for groceries, ensure that purchases are made at shops which offer a variety of fresh foods. Purchases should include fresh/frozen fruit and vegetables or fruit and vegetables canned in water (Canadian Heart and Stroke Foundation 2014). At work, schools, community centres and sports clubs, food policies which promote healthy eating, should be encouraged (Canadian Heart and Stroke Foundation 2014).

According to Dobbs *et al* (2014), nutrition education and encouraging personal responsibility for healthy eating are necessary, but not sufficient. Dobbs *et al* (2014) recommends weight management programmes for obesity prevention. According to Manning *et al* (2016), the majority of obese patients opt for individualised counselling as their ideal method for nutrition education. Many also opt for group-based weight loss programmes for professional guidance and peer support (Manning *et al* 2016). However, counselling has become a challenge in South Africa, as there are limited dietetic resources to meet the increasing burden of obesity (Manning *et al* 2016). According to Hu (2013), 'obesogenic foods' should be avoided. These include potato chips, French fries, red and processed meats, refined grains and desserts. The consumption of fruits and vegetables, whole grains, nuts and yoghurt are associated with a lower BMI (Hu 2013). Therefore, one should aim to improve overall diet quality in order to prevent long-term weight gain. With regards to alcohol, one and two unit/s a day is the maximum allowed for women and men, respectively (ADSA 2017).

The intake of SSBs should be gradually reduced in order to lose weight or prevent additional weight gain, with it eventually being cut out completely (Hu 2013). According to Grimes, Riddell, Campbell & Nowson (2013), emerging evidence states that a reduction in salt intake leads to a reduced SSB consumption. The mechanism behind this relationship lies in the homeostatic trigger of thirst in response to the ingestion of dietary salt. After consuming salt, the plasma sodium concentration increases. In order to maintain body fluid homeostasis, thirst

is stimulated, thus promoting fluid intake. Therefore, in addition to the known benefits of salt reduction on blood pressure, it could also assist with reducing the intake of SSBs. This in turn, reduces the risk of obesity (Grimes *et al* 2013).

2.2.7.2 Government-based obesity-preventative strategies

Obesity is an issue that needs to be addressed with a range of systematic, sustained government interventions, rather than just one solution (ADSA 2017; Manyema *et al* 2015; Dobbs *et al* 2014). A multicomponent approach is therefore vital for the creation of an enabling environment for the public to make healthy choices (ADSA 2017; Manyema *et al* 2015). Each of these interventions would have a small impact on its own. The portfolio of initiatives must be cost effective so that savings on health care and increased productivity will outweigh the cost of the investment used to deliver the intervention (Dobbs *et al* 2014). Additionally, the government should ensure that as many sectors as possible are involved, and their coordination is of utmost importance (Dobbs *et al* 2014). Ultimately, the success of the interventions reflects the effort and strength of commitment from the sectors. The objectives should be to achieve measurable, meaningful and verifiable outcomes (Wescott *et al* 2012).

The South African Minister of Health, Dr Aaron Motsoaledi, has mentioned the need for the regulation of foods which are high in sugar, such as SSBs, in order to address the obesity epidemic (Tugendhaft & Hofman 2014). Other food items have also been recommended for policy action to improve health. These include foods such as processed meats, energy-dense foods, fast-foods, foods containing saturated fat and 'junk food' (food of little/no nutritional value) (Cabrera Escobar *et al* 2013). The South African SSB tax is an example of policy action to improve health (National Treasury 2016). According to Hashem & Rosborough (2017), taxing is one of the most important approaches, as part of a multidisciplinary strategy. Policy interventions should include objectives and quantitative mechanisms for reporting and tracking progress (Wescott *et al* 2012). It is the responsibility of the government to ensure that the health of the population is protected through policies that encourage healthier dietary and lifestyle choices (Tugendhaft & Hofman 2014).

The government should also ensure that food industries adequately label their food products with nutritional details, as it assists in making dietary choices when shopping (Manyema *et al* 2015; Hu & Malik 2010; Dehghan *et al* 2005). Logos or symbols could be used to indicate healthy and unhealthy foods (Hashem & Rosborough 2017). According to the Canadian Heart and Stroke Foundation (2014), the government could set targets for the food industries to

decrease the free sugar content of their food items. Food and beverage choices are shaped by availability, price, awareness and marketing (Tugendhaft & Hofman 2014). Therefore, the extensive marketing of energy-dense foods and drinks, such as SSBs, via the media should be reduced (Hashem & Rosborough 2017; Manyema *et al* 2015; Hu & Malik 2010; Dehghan *et al* 2005). In addition, the availability of SSBs at various social settings such as work, parks and schools should decrease. Instead, water fountains should be installed (Canadian Heart and Stroke Foundation 2014). The government and the food industry can also work hand-in-hand to create healthier beverage options and reduce the packaging sizes of SSBs (Coca-Cola South Africa 2016; Canadian Heart and Stroke Foundation 2014).

Another strategy put forth by the South African government, pertains to the Life Orientation curriculum taught at school. This curriculum aims to provide learners with knowledge regarding nutrition (Shisana *et al* 2013). Life Orientation lessons are currently used to teach children about healthy eating and the importance of physical activity (Mahan *et al* 2016, p403; Manning *et al* 2016). Nutrition education is vital for children as this will create a lasting impact on their health choices (Hashem & Rosborough 2017; Dobbs *et al* 2014). The nutritional quality of foods sold at school should be improved, and the sale of 'junk-foods' at tuck shops should be stopped (Mahan *et al* 2016, p403). According to Langley *et al* (2017) and Jeffery (2016), SSBs should be banned in schools, and SSB industries should not be allowed to sponsor school events. In addition, the government could support school gardens, school meal programmes, healthy foods and beverages for school fundraising events, and guiding parents with lunch box ideas (Canadian Heart and Stroke Foundation 2014).

In South Africa, it is usually not safe to exercise in the local neighbourhood or at parks. In addition, there is a lack of recreational space for physical activity (Manning *et al* 2016). The South African government therefore needs to ensure that public parks and recreational facilities are easy to access, clean and safe. The use of these facilities must then be widely promoted (Manning *et al* 2016; Dehghan *et al* 2005). Healthy foods should be made available by the government to everyone, as it is a basic right (Cabrera-Escobar *et al* 2013). The access and availability of healthy foods and clean, safe water should be improved (Hu & Malik 2010). In addition, the South African government should instil a positive influence on healthy food choices (WHO 2016; Hu & Malik 2010). It is suggested that the revenue generated from the tax on SSBs should be used by the South African government to subsidise fruit and vegetables (ADSA 2017). According to the Canadian Heart and Stroke Foundation (2014), the

government should foster growth of local procurement initiatives and the improvement of the food distribution network to increase access to healthy foods.

The WHO recommends that the government should always work on improving the health care system (WHO 2016). Health care professionals should monitor the BMI of their patients and provide adequate counselling, tailored to the individual's needs (Mahan *et al* 2016, p403). According to Hawkes, Smith, Jewell, Wardle, Hammond, Friel, Thow & Kain (2015), health workers should focus on reducing obesity in childhood through the protection and promotion of breastfeeding, and the use of appropriate complementary foods in infants and young children. The government should also invest in research to measure the sugar and energy intake of the country, as well as assess the free sugar content of various food items (Canadian Heart and Stroke Foundation 2014). In South Africa, there is a document called 'The prevention and control of obesity in South Africa 2015-2020', which focuses on six broad goals. Some of these include the prevention of childhood obesity, enabling access to healthy food and promoting physical activity (ADSA 2017).

The South African NCD strategic plan highlights the importance of worksite interventions in addressing obesity (Tugendhaft & Hofman 2014). The plan was signed in 2011 and aims to reduce obesity and overweight by 10% by 2020 (Manyema *et al* 2014). Employees spend 60% of their waking hours at work. If these interventions are put in place, it could impact the adult population as well as their families. Employee wellness programmes have been in existence in South Africa since the 1980s. Some of the aspects covered include BMI screening, nutrition education and blood pressure screening (Tugendhaft & Hofman 2014). According to Dobbs *et al* (2014), walking or cycling to work instead of driving, should also be promoted among working class people to avoid a sedentary lifestyle.

2.3 The South African sugar-sweetened beverage tax as a strategy to address overweight and obesity

Obesity is a global epidemic and a major risk factor linked to the growing burden of NCDs (National Treasury 2016). The problem of obesity has escalated over the past 30 years in South Africa, resulting in the country being ranked the most obese country in sub-Saharan Africa. Due to these technical factors, the decision to tax SSBs was implemented on the 1st of April 2018 (National Treasury 2016). The tax aims to help reduce excessive sugar intake in order to reduce the prevalence of obesity. The SSB tax has been said to be only 'one piece to the puzzle' in solving the obesity epidemic (National Treasury 2016).

2.3.1 Sugar-sweetened beverages

Sugar-sweetened beverages are defined as 'beverages that contain added caloric sweeteners such as sucrose (50% glucose and 50% fructose), high fructose corn syrup (45% glucose and 55% fructose) or fruit juice concentrates (National Treasury 2016; Malik, Pan, Willett & Hu 2013). They are also classified as non-alcoholic water-based beverages (Canadian Heart & Stroke Foundation 2014). Sugar-sweetened beverages include soft drinks, fruit drinks, sports and energy drinks, vitamin water drinks, sweetened ice tea and lemonade. Unsweetened milk and 100% fruit juice are exempt from the South African SSB tax as they have intrinsic sugars. Artificially sweetened beverages are also excluded as they contain no sugar (National Treasury 2016).

Sugar-sweetened beverages contain free sugars. According to the WHO, free sugars are defined as any sugar which is added to foods and drinks by the manufacturer, cook or consumer, and any other sugars which are not in their natural form (Stacey, van Walbeek, Maboshe, Tugendhaft & Hofman 2017b). Although sugar is a carbohydrate which provides energy to the body, it has no further nutritional benefits. Sugar-sweetened beverages are the single largest contributor of sugar and energy in the diet (Canadian Heart & Stroke Foundation 2014), and has received attention for this reason (Hu 2013). Sugar-sweetened beverages are less satiating than solid sources of sugar, leading to its excessive consumption. In addition, they contain little else apart from sugar, artificial chemicals and water. In South Africa, SSBs account for a third of all sugar consumed by an average person (Myers *et al* 2017). A 330 ml carbonated SSB contains 7-9 teaspoons of sugar (approximately 35 g and 580 kJ), almost reaching the maximum daily recommended amount of 50 g as given by the WHO (ADSA 2017; Benade & Essop 2017).

2.3.1.1 The South African sugar-sweetened beverage market

Beverages are liquids for human consumption and forms a major part of the food industry (McSweeney 2016). The South African SSB industry began in the 1850s (Myers *et al* 2017), and has grown rapidly over the past 20 years due to the increased affordability, acceptability and availability of SSBs (National Treasury 2016). Sugar-sweetened beverages have become the most popular beverage consumed by youngsters in urban areas. Over a one year period, the average person consumes approximately 67 litres of Coke, a commonly consumed SSB (National Treasury 2016).

Currently, Coca-Cola, the largest beverage industry in South Africa has 60% of market share amongst soft drink companies, while 30 smaller companies account for the remaining 40% (Myers *et al* 2017). According to Coca-Cola South Africa (2016), the company contributes R60 billion to the GDP. In addition, Coca-Cola South Africa (2016) supports 294 000 jobs in South Africa, making up more than 1.7% of the total South African employment rates. Moreover, direct employment by the industry has increased by 5% since 2003 (Coca-Cola South Africa 2016). The industry's procurement has focused on domestic suppliers, especially for sugar, and makes a contribution to small scale farmers, small business owners and entrepreneurs. Therefore, the industry supports a thriving economy of retail outlets. Additionally, R18 billion worth of income taxes were generated from SSB manufacturing and sales in 2015 (Coca-Cola South Africa 2016).

Beverages are divided into alcoholic and non-alcoholic types, where sugar-sweetened beverages form part of the non-alcoholic category (McSweeney 2016). Sugar-sweetened beverage manufacturers use added sugar (which is refined sugar) in the processing of SSBs (Seedat & Singh 2017). This is natural cane sugar with the fibre removed. Added sugar can be in its natural form or in the form of fructose corn syrup. Fructose corn syrup is sometimes used in SSB manufacturing and is more harmful to health than refined sugar. The harmful effects of fructose corn syrup on health are attributed to its metabolic pathways in the body, which is different to that of simple sugars (Seedat & Singh 2017). Apart from sugar, water and preservatives are also used to manufacture SSBs, thereby increasing shelf-life (Manyema *et al* 2015).

A key factor influencing the consumption of SSBs is the widespread marketing of the products (Stacey *et al* 2017b). South African SSB manufacturers often partake in branding activities, which involves aggressive marketing. These types of marketing strategies are often directed at younger audiences (Stacey *et al* 2017b). In addition, demographic characteristics of the population are efficiently studied before advertising. In South Africa, the highest consumers of SSBs are young males. In order to target this audience, television adverts are displayed on the channels which young males are most likely to view (Stacey *et al* 2017b). These include channels such as sports, music and entertainment. Sometimes, SSB companies use role modelling of significant others in order to make their advertising more impactful (Stacey *et al* 2017b). Furthermore, appealing packages and point of purchase displays are used (Stacey *et al* 2017b). The South African SSB market has pledged to no longer advertise to children under

the age of 12 years. The reality, however, is that children still remain exposed to adverts via billboards, television and the internet (Myers *et al* 2017).

Marketing strategies also include making SSBs highly available and affordable to influence their consumption (Stacey *et al* 2017b). Sugar-sweetened beverages are found nearly everywhere, especially in social settings, where alcohol is sold. The areas where SSBs are available include take-away outlets, restaurants, vending machines, convenience stores, tuck-shops, bars, casinos, malls, schools, work sites and petrol stations. The prices of SSBs are made highly affordable to enable the market to dominate (Stacey *et al* 2017b). Price promotions allow for an increase of 31% in sales. The SSB market offers an increasing variety of products to adjust to consumer preferences. Additionally, over the last few decades, there has been a rise in SSB consumption, which could be partially attributed to the increase in portion sizes. Finally, the taste and quality of the product also greatly influences its consumption rates (Stacey *et al* 2017b). National surveillance has shown that taste is the second major determinant of food purchasing, with price being first (ADSA 2017).

2.3.1.2 Consumption trends of sugar-sweetened beverages in South Africa

Consumption trends of SSBs have increased worldwide, with South Africa being classified as one of the top 10 consumers of SSBs (Manyema *et al* 2015). In 2002, South Africa consumed 183 Coca-Cola products per person, per year. By 2012, this value had increased to 260. To put this into perspective, the worldwide average is 94 (Manyema *et al* 2015). Consumption rates rose by 69% between 1999 and 2012. The proportion of adults consuming SSBs in rural areas rose from 25% to 56% among women, and 33% to 63% among men, between 2005 and 2010. According to the SANHANES-1, an average of 186 ml and 161 ml of SSBs was consumed per day in urban areas and informal areas, respectively (Shisana *et al* 2013). It is therefore evident that the consumption rates of SSBs have increased in South Africa (Manyema *et al* 2015). According to Wescott, Fitzpatrick & Phillips (2012), consumption rates of SSBs increase when its availability increases. Overconsumption of SSBs is also supported by intense marketing strategies in terms of offer, distribution, price and promotions (Hu 2013).

According to Seedat & Singh (2017), the SSB tax would be most effective in countries such as South Africa, where the intake of SSBs and obesity rates are high. The consumption of SSBs accounts for 10.3% of daily energy intake. The per capita consumption of SSBs in 2011 was 39 litres per annum. This value increased to 48 litres per annum in 2016 (Seedat & Singh 2017). According to Stacey, Tugendhaft & Hofman (2017a), the per capita consumption in

1991 was 132 servings annually and increased to 254 servings by 2010. In addition, it is estimated that South Africans now consume about 184 ml of SSBs a day. This figure is expected to increase over the next few years (Seedat & Singh 2017). Stacey *et al* (2017b) reported that across beverage categories, energy drinks achieved the highest sales volume growth in South Africa. Between 2009 and 2014, the annual volume of energy drinks sold increased from 97.7 million litres to 167.7 million litres. The consumption of energy drinks is highest among affluent males who are less than 45 years of age (Stacey *et al* 2017b). In terms of overall SSB sales in South Africa, 3620 million litres were sold in 2008. By 2013, this value had increased to 4203 million litres (Manyema *et al* 2015).

Benade & Essop (2017) compared the daily average consumption values of various beverages in South Africa. The daily average consumption of unsweetened fruit juice, SSBs and milk was 200 ml, 184 ml and 204 ml, respectively. According to Berkey, Rockett, Field, Gillman & Colditz (2004), a high SSB intake decreases the amount of milk consumed by children and adolescents. In addition, it contributes to a high dietary energy intake. Children consume approximately 40-60 g of added sugar per day, rising to as much as 100 g per day in adolescents. This represents 5-10% of dietary energy but could be as much as 20% in many cases (ADSA 2017). The main sources of added sugar among children in South Africa are white sugar and SSBs (mainly carbonated beverages and squashes) (ADSA 2017). Sugar-sweetened beverage consumption declines with increasing age. The age group which consumes the largest amount of SSBs is the 15-24 year old age category, while those 65 years and older consume the least (Benade & Essop 2017).

The average South African consumed 36.4 kg of sugar between 2012 and 2013 (Myers *et al* 2017). The high intake of sugar in South Africa is attributed to the nutrition transition which is defined as ‘changes in dietary patterns and nutrition intake which occur due to economic development and urbanisation’ (Benade & Essop 2017). With this being said, South Africa is well known for its income inequalities (Department of Economic and Social Affairs 2012). This means that the affluent spend less on food than the poor. However, the affluent ultimately consume more and purchase more. People with a lower socio-economic status spend more than 30% of their income on food, while the affluent spend 10% (Department of Economic and Social Affairs 2012). With regards to SSB purchases, people with a lower socio-economic status spend 1.3% (or R122 per year) of their income on SSBs, while the affluent spend 0.7% (or R1 643 per year) (Department of Economic and Social Affairs 2012).

Sale volumes and consumption rates of SSBs have increased over the years worldwide, including South Africa (Benade & Essop 2017). This is due to the fact that SSBs have become highly affordable, especially in low and middle-income countries (such as South Africa) (Benade & Essop 2017). Steyn & Mchiza (2014) indicated that a 1% increase in SSB consumption in a country leads to an additional 4.8/100 overweight adults, 2.3/100 obese adults and 0.3/100 diabetic adults. The prevention of long-term excess weight gain by reducing SSB consumption is more effective than reducing the prevalence of obesity by short-term weight loss, among those who are already obese (Hu 2013).

2.3.1.3 Alternatives to sugar-sweetened beverages

Sugar-sweetened beverages contain large amounts of added sugar and offer no health benefits (Woodward-Lopez *et al* 2010). It is for this reason that health care workers often try to discourage the consumption of SSBs. Alternatives to SSBs are available on the market and include coffee, tea and artificially sweetened soft drinks, however; the benefits of these should be considered (Woodward-Lopez *et al* 2010). There is no 'perfect' alternative to SSBs apart from water, which is considered to be the healthiest beverage option (Hu 2013; Hu & Malik 2010). It is vital for the government to ensure that water is made safe for consumption and readily available; however, this is not the case in some developing countries due to a lack of finances and resources (Hu 2013). Water is the ideal beverage option as it is healthy and cheap (Hu 2013; Hu & Malik 2010). In addition, water does not contain any liquid calories (Hu 2013; Hu & Malik 2010). Studies suggest that consuming water before a meal can increase satiety and subsequently decrease energy intake (Hu 2013). Moreover, replacing one SSB a day with water leads to a 0.49 kg reduction in weight over a four year period (Hu 2013; Hu & Malik 2010).

Tea and coffee are considered the most important beverages in the world (McSweeney 2016). Furthermore, their popularity has increased as healthier beverages compared to other non-alcoholic beverages. Caffeine constitutes to the dry weight of tea and coffee, depending on the brand, type and brewing method (McSweeney 2016). A low to moderate dose of caffeine from coffee can increase alertness, motivation, energy levels and improve cognitive performance. However, consuming too much caffeine can lead to anxiety, nervousness, sleep disturbances and tension (McSweeney 2016). Tea and coffee are said to be beneficial to health due to their high polyphenol content including flavonoids and catechins. Black or green tea has a protective effect against cancer and Alzheimer's disease. Moreover, black or green tea can help assist

with the management and maintenance of weight loss. However, the health benefits on the prevention of NCDs have not yet been demonstrated (McSweeney 2016). Although tea and coffee have beneficial effects on health, care should be taken to avoid the over use of sugar, creamers and/or full cream milk together with tea. These additions to tea or coffee can substantially increase the energy content, thereby leading to weight gain when consumed in excess (McSweeney 2016; Malik & Hu 2015).

Fruit juice is produced by squeezing or macerating fruit flesh using the hand or electric squeezers (McSweeney 2016). Fruit juice was not a popular beverage until pasteurisation methods were well established, which allowed for preservation without fermentation (McSweeney 2016). Fruit juice is often consumed for its health benefits. For example, orange juice contains large amounts of vitamin C, folic acid and vitamin K. In addition, it is an excellent source of bioavailable antioxidant phytochemicals (McSweeney 2016). With this being said, consuming fruit juice in excess leads to a high fructose intake. Based on nutritional labelling information, 330 ml of SSB and fruit juice contains 40 g and 45 g of sugar, respectively (Manyema *et al* 2015). Hence, risk for weight gain and dental caries increases (McSweeney 2016). According to Stacey *et al* (2017b), the effects of fruit juice consumption on weight gain and diabetes are comparable to those of other SSBs. Although the energy and sugar content of fruit juice is questionable, the micronutrient content makes fruit juice a better option than SSBs (Hu 2013; Hu & Malik 2010).

Artificially sweetened beverages are considered better alternatives to SSBs as they contain little or no energy and/or sugar (Hu & Malik 2010). It is for this reason, that they are exempt from the SSB tax (National Treasury 2016; Hu 2013). Artificially sweetened beverages may contain aspartame or acesulfame K, instead of fructose or sucrose (Hu 2013). According to Cabrera Escobar *et al* (2013) and Hu (2013), artificially sweetened beverages have the potential to reduce weight gain and body fat gain in children and adolescents. In addition, it can help control total energy intake and prevent further weight gain in those who are already overweight or obese. However, little is known about the long-term effects of artificially sweetened beverage consumption (Hu & Malik 2010). Some studies suggest that there is a positive association between the consumption of artificially sweetened beverages and weight gain, risk of metabolic syndrome and type 2 diabetes mellitus. However, further studies are required as the evidence is not strong (Hu 2013; Cabrera Escobar *et al* 2013; Hu & Malik 2010). In addition, some studies have suggested that the intense sweetness may lead to an increased preference for sugary foods and enhanced appetite. Again, further studies in this area are

required (Hu 2013; Hu & Malik 2010). Moreover, Hu (2013) indicated that consumers of artificially sweetened beverages may use the choice as a rationale for consuming other high energy foods, inevitably leading to weight gain.

2.3.2 Health effects of sugar-sweetened beverages

Sugar-sweetened beverages contain large amounts of added sugar, which is the main reason for its negative health effects (Woodward-Lopez *et al* 2010). High levels of sugar and energy intake from SSBs, ultimately leads to excessive weight gain. In addition, the consumption of SSBs can lead to a decreased feeling of satiety; hence, food consumption may increase to make up for this (Woodward-Lopez *et al* 2010). According to the literature, obesity leads to a number of negative health consequences, especially NCDs. Obesity and NCDs jeopardise the quality of life and may lead to premature death in some cases (Malik & Hu 2015). Apart from obesity and NCDs, dental caries is also a health concern from SSB consumption and may have a negative effect on quality of life (National Treasury 2016).

2.3.2.1 Obesity and non-communicable diseases

As the search for the solution to the obesity epidemic continues, the relationship between SSB consumption and obesity has become an area of great scientific interest (Malik *et al* 2013). The link between SSB consumption and obesity and NCDs, is now well established (Malik & Hu 2015; Cabrera Escobar *et al* 2013; Malik *et al* 2013). According to Talbot & Pienaar (2012), there is increasing evidence of 'sugar addiction'. It has been shown that the way in which the brain responds to sugar in an obese individual, is similar to the response of a cocaine addict's brain, when a dose of the drug is administered. This study also showed that it is not the foods that are addictive, but the chemistry of the components, such as sugar in SSBs (Talbot & Pienaar 2012). According to Westwater, Fletcher & Ziauddeen (2016), sugar addiction can be compared to drug addiction because both display the following symptoms: withdrawal symptoms, cravings and loss of control. However, defining sugar addiction remains a challenge (Westwater *et al* 2016; Talbot & Pienaar 2012).

Drinking just one SSB a day, increases the likelihood of being overweight by 27% for adults and 55% for children (Tugendhaft & Hofman 2014). One serving of a SSB per day over one year increases BMI by 0.06 kg/m² and between 0.12-0.22 kg/m² among children and adults, respectively (Malik *et al* 2013). Those who consume more than one serving of an SSB a day, are more likely to trigger the genes which cause obesity (Malik & Hu 2015). According to

Cabrera Escobar *et al* (2013), individuals with a high genetic predisposition may be more susceptible to obesity induced by SSBs. Genetic factors (such as ethnicity) cause adiposity and glucose intolerance, which in turn, influences the effect of SSB intake on metabolism and weight gain (Westwater *et al* 2016).

The sugar consumed from SSBs leads to adverse abdominal adipose tissue deposition patterns (Malik *et al* 2013). After an SSB is consumed, most of the sugar will not be used for energy and the liver will then convert the sugar into fatty acids, which get stored as fat. In response to a rise in sugar levels in the blood, the body produces insulin. When blood glucose levels drop (which occurs after consuming SSBs as they have a high glycaemic index), a sugar craving may start, leading to increased sugar intake and thus additional weight gain (Seedat & Singh 2017; Malik *et al* 2013; Berkey *et al* 2004). Therefore, as the consumption of SSBs increases, weight gain also increases in a dose-response manner (Hu 2013). Reducing SSB intake has the greatest impact on weight for those who are already frequent SSB consumers (Hu 2013). In addition, eliminating SSBs from the diet in adults is an effective way to prevent age-related weight gain (Malik *et al* 2013).

The risk of NCDs increases directly according to weight gain (Seedat & Singh 2017). However, in some cases, simply consuming excess sugar places an individual at risk for NCDs, even in the absence of weight gain (Tugendhaft & Hofman 2014). Sugar-sweetened beverages promote the onset of NCDs through direct and indirect mechanisms (Benade & Essop 2017). Sugar-sweetened beverage intake may have direct metabolic effects that occur independently of body weight and energy balance. The changes in blood metabolites after SSB consumption cause increased blood pressure, dyslipidaemia, insulin resistance and inflammation. All of these lead to the onset of NCDs such as CVD, diabetes and hypercholesterolemia (Benade & Essop 2017). According to Hu (2013), fructose from SSBs is the main promoter of the accumulation of adiposity and deposition of ectopic fat. It is the only sugar which increases serum uric acid levels. Uric acid in the liver lowers the endothelial nitric oxide levels, leading to NCDs (Hu 2013).

Fructose has a unique role in the pathogenesis of obesity and NCDs (Malik & Hu 2015). Sucrose, which is made up of one fructose and one glucose molecule, is often used in the production of SSBs. However, high fructose corn syrup is often used instead of sucrose, as it is cheaper. The consumption of SSBs therefore accounts for the majority of dietary fructose intake. Fructose metabolism is different to glucose because insulin secretion is not required.

Therefore, plasma glucose levels do not increase (Malik & Hu 2015). However, excess fructose consumption, from SSBs, can promote triglyceride synthesis. In addition, it can also cause high uric acid production which induces metabolic complications. Therefore, there are differences in the hepatic metabolism of glucose and fructose (Malik & Hu 2015).

A change in societal and economic factors over the years has affected diet and physical activity (Roberto *et al* 2015). Urbanisation and industrialisation have progressed, increasing the marketing of SSBs. In addition, there is a lack of nutrition information and/or a lack of education regarding nutrition labelling (Roberto *et al* 2015). The price of SSBs has decreased and their consumption has increased. In addition, these products are widely available, accessible and acceptable to the public (Powel *et al* 2013).

Apart from obesity and NCDs being a concern from excess SSB intake, there are a few others. Children who consume large amounts of SSBs have a low micronutrient intake (Cabrera Escobar *et al* 2013), which puts them at risk for micronutrient malnutrition (ADSA 2017). Calcium displacement is the major concern. Calcium intake from milk and milk products is reduced as soft drink intake increases (Westwater *et al* 2016). Consumers of large amounts of SSBs also report decreased water intake (Westwater *et al* 2016). Finally, those who consume SSBs frequently are also at risk for excess caffeine intake (Stacey *et al* 2017b). This is dangerous as it may lead to palpitations, hypertension, diuresis, central nervous system stimulation, nausea, vomiting, hypokalaemia, metabolic acidosis and convulsions (Stacey *et al* 2017b). This is especially a concern in pregnant women as it could result in new-borns who are small for gestational age, late miscarriages and stillbirth. It could also cause negative behavioural and cognitive outcomes in young children (Stacey *et al* 2017b).

2.3.2.2 Dental caries

Dental caries is one of the most common childhood diseases and is a silent epidemic that affects many people (Smit, Barrie & Louw 2017). The prevalence of childhood dental caries in developed countries is between 1% and 2%, while the prevalence in developing countries is 70%. In South Africa, the Western Cape is the province with the highest prevalence of dental caries among children, while the Limpopo province has the lowest prevalence (Smit *et al* 2017). According to the National Treasury (2016), the prevalence of dental caries in children 4-6 years old is 50-60%. In terms of the older age groups, only 2% of 44 year olds have healthy gums (Myers *et al* 2017).

The increased prevalence of dental caries and severity can be explained by the consumption of a high sugar diet, including SSBs (Smit *et al* 2017; National Treasury 2016; Beaglehole 2015). There is a strong link between the amount and frequency of sugar and/or SSBs consumed and dental caries. Frequent intake of sugar and/or SSBs and prolonged contact of these substances with teeth, are risk factors for dental caries (Beaglehole 2015). This is because sugar gets metabolised by bacteria in the mouth, which use the available sugar to make acid. If the teeth are exposed to this acid for long enough, the tooth enamel is demineralised and dental caries occurs (Moynihan & Kelly 2014). The WHO recommends that one should limit sugar intake to < 5% of total energy intake per day, in order to minimise the risk of dental caries (Moynihan & Kelly 2014).

The effects of dietary sugar on dentition are lifelong, yet it is preventable (Moynihan & Kelly 2014). Apart from this, dental caries leads to severe pain and discomfort. In addition, there may be loss of self-confidence, due to appearance or bad breath (Moynihan & Kelly 2014). The risk of dental caries is cumulative; therefore, by reducing SSB intake in childhood, it could have a protective effect on dental health in the future (Moynihan & Kelly 2014).

2.3.3 The sugar-sweetened beverage tax

The WHO encourages the implementation of a SSB tax to reduce its consumption and encourage healthier food choices. This has become part of the 2013 Global Action Plan (National Treasury 2016). A SSB tax is part of a portfolio of nutrition-enhancing policies aimed at the prevention of obesity and NCDs (Le Bodo & De Wals 2018). When considering the implementation of a SSB tax, the following aspects should be taken into consideration: tax objectives, tax type, tax scope, tax base, tax scale and the usage of the tax revenue. These factors will not only condition the feasibility and acceptability of the tax, but it may also influence the impact of the SSB tax (Le Bodo & De Wals 2018). Food policies work well when the interactions between the environment and food preferences are identified beforehand (Hawkes *et al* 2015).

The SSB tax is the cheapest strategy to reduce obesity, compared to others (National Treasury 2016). The expected cost per person for the implementation of a SSB tax is 20 cents. Food advertising regulations, food labelling, worksite interventions, mass media campaigns, school based interventions and physician counselling would cost 90 cents, R2.50, R4.50, R7.50,

R11.10 and R11.80 per person, respectively (National Treasury 2016). Sugar-sweetened beverage taxes are likely to receive more public support when they are aimed at promoting the health of key groups (Myers *et al* 2017). Studies suggest that people are increasingly in favour of the SSB tax if they are aware that the revenue will be used for obesity-preventative strategies, and not government revenue (Myers *et al* 2017). Although the SSB tax is aimed at reducing obesity and SSB intake, some may view it as a government intervention to control what people may or may not consume (Talbot & Pienaar 2012). This leaves the impression of a 'nanny state' because some believe that no one should interfere with their personal choices regarding their health. However, this is mostly applicable to Americans as they highly value freedom of choice (Talbot & Pienaar 2012). Whether this will be an issue for South Africans, is unknown (Dana & Nadler 2018; Talbot & Pienaar 2012), and should be investigated.

2.3.3.1 Taxation logistics

Sugar-sweetened beverages, like alcohol and tobacco, have no nutritional value and when consumed in excess, may become harmful (Cabrera Escobar *et al* 2013). Therefore, a tax is implemented to change food consumption patterns and purchasing behaviours (ADSA 2017; Blecher 2015; Hu 2013). In doing so, taxes bring about rapid and effective changes in the food environment (Hu 2013). According to Blecher (2015), the power of the sin tax is well established. The SSB tax is a fiscal policy which is cost effective and easily implemented on a wide scale (ADSA 2017). In the long-term, the SSB tax aims to reduce the consumption of SSBs at an individual and household level, hereby decreasing obesity and NCD rates in South Africa (ADSA 2017).

On the contrary, sin taxes, such as the SSB tax, are a 'blunt instrument' that have an unpredictable effect on consumer behaviour, as well as unintended consequences (Minton 2016). Additionally, experience from past studies show that sin taxes are a disadvantage to those least able to absorb the cost, without measurably improving public health (Minton 2016). With this being said, sin taxes are used to increase the prices of unhealthy goods, such as SSBs, with the hope of discouraging unhealthy lifestyle behaviours, which negatively affect society. At the same time, revenue is raised in order to off-set the public costs of the harmful products and/or to fund government programmes (Minton 2016).

The SSB tax has a clear awareness-raising element to it, by reinforcing that the taxed item is an unhealthy choice and can therefore lead to weight gain. Additionally, it may persuade manufacturers to reformulate (Hashem & Rosborough 2017; ADSA 2017). According to Dilk

& Savaiano (2017), the SSB tax is not a 'magic bullet' which will combat obesity. The SSB tax should be combined with interventions such as nutrition education, nutrition labelling, regulations on advertisements and decreasing the availability of SSBs, for a greater impact (Dilk & Savaiano 2017). The SSB tax can work more effectively if the volume of sugar, rather than the volume of beverage, is taxed (Blecher 2015). A volumetric rate is more likely to increase revenue for the government and tackle the epidemic of obesity. In addition, it is easier to administer and has a larger price impact on large package size beverages (Blecher 2015).

Unlike a sales tax, which is added at the till and paid directly by the consumer, an excise tax (such as the SSB tax) is levied before the point of purchase (Falbe, Rojas, Grummon & Madsen 2015). Therefore, when the SSB tax is passed onto consumers, it is already included in the price (Dana & Nadler 2018), so that the price seen by consumers on the price tag is what will be paid at the till. Sales taxes are more salient to consumers than excise taxes, because they result in higher shelf prices at the point of decisions, thus deterring purchase (Dana & Nadler 2018; Falbe *et al* 2015). In response to an excise tax, distributors are expected to increase SSB prices for the retailers, who in turn, are expected to increase the shelf prices for consumers (Falbe *et al* 2015).

2.3.3.2 History of the tax worldwide and in South Africa

The first SSB was produced in the 1800s; however, it only became popular during World War 2 (Benade & Essop 2017). This was because free Coca-Cola products were donated to the United States army during this period. The consumption of SSBs started to rise significantly between 1970 and 2000. In addition, the consumption patterns of SSBs revealed a larger intake in non-Western, low-or middle-income countries, compared to high-income countries (Benade & Essop 2017).

Sin taxes existed since the reign of Queen Cleopatra VII of Egypt (Minton 2016). She made the decision to tax beer in order to reduce drunkenness and raise money for war against Rome (Minton 2016). In 1776, Adam Smith, a Scottish philosopher and economist, stated that he supported taxing tobacco, alcohol and sugar, since none were considered necessary for life (Blecher 2015). In 1791, Alexander Hamilton, one of the founding fathers of the USA, introduced a sin tax in Pennsylvania. The aim was to alter the negative behaviours of tax payers, especially amongst the poor who could not afford to spend on sin goods (Talbot & Pienaar 2012).

The first SSB tax was introduced in the USA during World War 1, with the money generated from the tax being used to fund the war (Talbot & Pienaar 2012). In addition, the funds were able to help absorb some of the costs from the Great Depression in the early 1930s (Talbot & Pienaar 2012). Sugar price control had therefore come about in 1934 during the Great Depression (Dilk & Savaiano 2017). It was referred to as the 'Sugar Act of 1934' and aimed to stimulate the American economy. By 1974, this act had expired (Dilk & Savaiano 2017). In 1976, President Ford tripled the import tariff on sugar and in 1977, the International Trade Commission advised President Carter to establish a quota for sugar imports (Dilk & Savaiano 2017). Thereafter, the Agriculture and Food Act of 1981 further increased the sugar prices. By 1996, limits on sugar marketing had been implemented in the USA (Dilk & Savaiano 2017).

During the year 2000, 19 USA states had minor taxes on SSBs, sweets and snacks. This raised more than 1 billion dollars in tax revenue, which was used for government income, assisting medical and educational institutions, environmental concerns, refuse control and violence and drug control (Talbot & Pienaar 2012). With regards to South Africa, a SSB tax was proposed in 2016 and implemented in 2018 (National Treasury 2016). Ideas and proposals regarding the SSB tax stem from other countries such as the USA. With this being said, research regarding the SSB tax is still ongoing as it is fairly new in South Africa (National Treasury 2016).

2.3.4 Reasons for the implementation of the South African sugar-sweetened beverage tax

There are four main reasons for the implementation of a sugar tax in South Africa. These are discussed in this section. Firstly, the tax may contribute to decreasing obesity and sugar consumption in the country (Jeffery 2016). In addition, the money generated from the sugar tax in South Africa could serve as income for the government (Jeffery 2016). Furthermore, the tax could be used to fund anti-obesity interventions (ADSA 2017), and/or to encourage manufacturers of SSBs to reformulate their products and take nutrition labelling seriously (National Treasury 2016).

2.3.4.1 Generating revenue

South Africa requires more revenue (Jeffery 2016) and has succeeded by increasing value added tax (VAT) from 14% to 15% in April 2018. It seems that the government views the sugar tax as a simple and convenient way to generate income, with the hope of also achieving positive health outcomes (Jeffery 2016). The sugar tax is expected to bring in about R10.5

billion per year, whereas a 1% VAT increase would double this value (Jeffery 2016). Therefore, the sugar tax revenue could 'correct' the budget deficit in a country (Duckett & Swerissen 2016). Taxing sugar may also help to recoup the costs of obesity (Duckett & Swerissen 2016). These costs refer to the large portion of revenue spent on health care costs due to obesity and its complications (Duckett & Swerissen 2016). In terms of administration, the sugar tax has been implemented through the Customs & Excise Act (Act 91 of 1964) (National Treasury 2016).

2.3.4.2 Positive health outcomes

Evidence suggests that SSBs contribute towards weight gain and negative health outcomes (Woodward-Lopez *et al* 2010), due to their high sugar content (Hu & Malik 2010). Diets that contain large amounts of sugar are energy-dense and lead to excessive weight gain and NCDs (National Treasury 2016). The Sustainable Development Goals proposal specifically mentions NCDs with the following target: 'by 2030, reduce by one third pre-mature mortality from NCDs through prevention and treatment and promote mental health and well-being' (Manyema *et al* 2015). The South African NCD strategic plan also has a goal which states: 'reduce premature mortality from NCDs by at least 25% by 2020'. The SSB tax is likely to be able to contribute to these goals (Manyema *et al* 2015).

A sugar tax aims to reduce SSB consumption and thereby, obesity in the country (Jeffery 2016). The aim is more specific to low income earners, as the prevalence of obesity is highest amongst them. However, there is no evidence that the South African SSB tax is guaranteed to reduce obesity in South Africa (Jeffery 2016). According to the National Treasury (2016), the SSB tax aims to reduce obesity by 10% by 2020. A 20% increase in the prices of SSBs is required to influence consumer purchasing decisions, SSB consumption levels and overall population health (National Treasury 2016).

Coca-Cola is the largest beverage manufacturer in South Africa and has published a statement with their opinion on the sugar tax. According to the statement by Coca-Cola South Africa (2016), the SSB tax will barely have an impact on obesity, even in the best scenario. Evidence from the Food and Agriculture Organization (FAO) of the United Nations, has indicated that SSBs contribute only a small percentage to total energy intake (3%) in the South African diet. It is agreed that energy intake has risen over the years; however, the consumption of added sugars has declined. In addition, Coca-Cola stated that the increased energy intake could be attributed to the consumption of cereals and vegetable oils, rather than SSBs. Furthermore,

Coca-Cola South Africa (2016) used a study by Dobbs *et al* (2014), to show that SSB taxes are one of the least effective policy interventions that government could use to decrease the rates of obesity.

2.3.4.3 Funding of anti-obesity interventions

According to Duckett & Swerissen (2016), money generated from the SSB tax could be used to promote healthy eating and prevent obesity. According to the WHO (2014), the aims should be to create incentives to encourage behaviours associated with improved health outcomes and improved affordability. In addition, it should encourage the consumption of healthy food and discourage the intake of less healthy options (WHO 2014).

According to ADSA (2017), the tax generated should be used to support the implementation of the National Department of Health Strategy for the Prevention and Control of Obesity in South Africa. The interventions planned in the strategy include the following: creating an institutional framework to support inter-sectoral engagement; creating an environment where healthy food choices are available and accessible; increasing the amount of people engaging in physical activity; supporting the prevention of childhood obesity; nutrition education and mobilisation of communities and establishing a surveillance system where monitoring, evaluation and research will be strengthened (Department of Health 2016).

2.3.4.4 Reformulation of sugar-sweetened beverages and nutrition labelling

According to the National Treasury (2016), an increase in the price of SSBs (due to taxation) will reduce their demand amongst consumers. This would ultimately result in decreased production and/or forced changes in the formulation of the product. The National Treasury (2016) hopes to use the SSB tax to encourage all SSB manufacturers to provide a nutrition label on their products. To further elaborate, if the SSB manufacturer does not provide the nutrition label, it will be assumed that the product contains 50g of sugar per 330ml SSB. The tax will be charged accordingly.

Coca-Cola South Africa (2016) is aware of the problem of obesity and has already started decreasing the sugar content in their products. It has also introduced smaller volumes to help the public with portion control. In addition, Coca-Cola is committed to collaborating with the government to develop effective ways to address the obesity issue in the country and generate tax revenues. By reformulating SSBs, decreasing volume sizes and promoting artificially-

sweetened drinks, Coca-Cola aims to reduce daily energy intake by 59-75 kJ per capita by 2020 (Coca-Cola South Africa 2016).

2.3.5 The South African sugar-sweetened beverage tax rate options

Research shows that a 20% price increase in SSBs is required to have an impact on consumption and health outcomes (Langley *et al* 2017). It is important to study the various tax rate options in order to determine which option would work best in a specific country. In addition, the advantages and disadvantages need to be considered. Finally, for each option, the information needs to be clearly defined (National Treasury 2016).

2.3.5.1 Flat levy

With the South African sugar tax, a rate of 2.29 cents per litre of SSB is applied. For example, if a beverage were made up of 2 L, the rate of tax would be 2.29 cents times 2 L. The same rate would be used regardless of the sugar content of the SSB (National Treasury 2016). This method is very simple to administer, however, there would be no incentive for the manufacturers to reformulate. This would merely become a revenue-generating scheme (National Treasury 2016).

2.3.5.2 Per gram

The 'per gram' method had been previously proposed for use in South Africa, where every gram of sugar in SSBs would be taxed at 2.29 cents per gram (National Treasury 2016). However, the threshold method was adopted rather than the 'per gram' method.

2.3.5.3 Threshold

The 'threshold' method implies that a minimum sugar content level would be tax-free and only the added sugar above the threshold, would be taxed (National Treasury 2016). There would be higher administration costs to implement this method. The rate would be 4.1 cents per gram of sugar above 5 g. This method has been implemented in South Africa (National Treasury 2016).

2.3.5.4 Default category

If an SSB does not have a label with nutritional information, it will be assumed that it contains 50 g of sugar per 330 ml and will be charged accordingly. This would encourage those

manufacturers who do not provide nutrition information on the SSB, to do so (National Treasury 2016).

2.3.6 Impacts of the South African sugar-sweetened beverage tax

The impacts of a SSB tax on other countries such as Mexico and the UK (United Kingdom) have been investigated. However, it is not yet known how the South African SSB tax will impact South Africa (ADSA 2017). The main 'goal' of the SSB tax is to impact the obesity rates, sugar intake and SSB consumption by reducing these elements. With this being said, the SSB tax may also have a negative impact on the South African economy. While these factors have been explored in a few studies, more South African studies on the impact of the sugar tax are needed.

2.3.6.1 Obesity

According to Jeffery (2016), a 20% SSB tax in South Africa has the ability to reduce the number of obese people. To illustrate further, obesity would reduce among adult men and women by 3.8% and 2.4%, respectively. The average decline in energy intake would be 30 kJ per person, per day (Manyema *et al* 2014). According to Jeffery (2016), it is questionable whether the small reduction in obesity is worthwhile, compared to the high unemployment rate and poor financial situation in South Africa. The National Treasury (2016) proposed that the sugar tax in South Africa would decrease obesity from 13.5% to 13% in men, and from 42% to 41.2% in women. However, this is mentioned with a wide degree of uncertainty. Minton (2016) stated that a SSB tax, at a rate of 40%, would decrease weight minimally after a year. Yet, those who approve of the SSB tax have indicated that the tax rate is too low (Minton 2016).

According to Langley *et al* (2017), it is uncertain whether an SSB tax will actually reduce the number of people who are overweight or obese in a population. People may turn to alternative drinks such as full cream milk and fruit juice, snacks high in kilojoules or buy SSBs from small, untaxed manufacturers. Therefore, this may account for the 'lost' kilojoules not taken in from the SSBs and may result in unchanged obesity rates (Langley *et al* 2017). Proof regarding this theory has been outlined by Cabrera Escobar *et al* (2013), where the demand for high fat milk and fruit juices increased when SSBs were taxed, in Mexico and the UK. Whether the consumption of other sugar-sweetened products and confectionaries increased, is unknown (Cabrera Escobar *et al* 2013). According to Seedat & Singh (2017), more obesity-preventative

strategies are needed to 'help' the SSB tax to reach its objectives. These strategies could include nutrition education, thought provoking campaigns, nutrition labelling, provision of safe water, subsidising the price of fruit and vegetables and creation of exercise programmes (Seedat & Singh 2017).

2.3.6.2 Sugar intake and SSB consumption

In order to understand how consumers will respond to increases in SSB prices, one needs to understand the sensitivity to price, socio-economic status of the population and substitute products available in the market (Theron, Rossouw & Fourie 2016). Price responsiveness may vary across income groups and consumption intensity. Those who consume larger volumes of SSBs would be less sensitive to price changes (Quirmbach, Cornelsen, Jebb, Marteau & Smith 2018). Unlike with tobacco and alcohol, consumers might be less sensitive to price changes of SSBs because they have multiple high sugar, high energy substitution options (Coca-Cola South Africa 2016). In economics, 'elasticity of demand' is the amount that demand changes in response to a change in price or supply (Minton 2016). The elasticity of demand varies for every product and person. For example, milk and petrol are inelastic because they are necessities. Even though the prices of milk and petrol may increase, people still purchase them, even if it means cutting back on other purchases (Minton 2016). The lower the elasticity of demand unit, the less elastic the product is. To put this into perspective, the price elasticity for petrol is -0.26, versus 0.76 for SSBs (Minton 2016).

According to the SANHANES-1, 20% of South Africans have a high sugar intake. Sugar intake was highest among the youngest age group surveyed, which were 15-24 year olds (Shisana *et al* 2013). According to Jeffery (2016), the extent of changes in consumption, resulting from a SSB tax is debatable. Other literature findings about the impacts of the sugar tax on changes in SSB consumption are sometimes inconclusive and contradictory. The National Treasury (2016) stated that an SSB tax would decrease energy intake by 36 kJ a day. However, given the uncertainty, it could be as little as 9 kJ a day.

According to Langley *et al* (2017), existing literature shows a promising relationship between increased prices of SSBs and reduced intake of SSBs. However, if the public were to turn to alternative high energy, high sugar sources, this could result in an unchanged sugar intake and may limit the benefits of the sugar tax (Langley *et al* 2017; Minton 2016). Minton (2016) suggested that some people may cut back on other groceries in order to allocate more money towards SSB purchases. Research has revealed that consumers rarely switch from SSBs to

sugar-free options or water. They would usually go for equally high energy products. High sodium and fat consumption usually occur as a result of product substitution (Minton 2016).

If manufacturers were to decrease the sugar content in their products, this would help to reduce sugar intake in the population. However, it is possible that the public will increase their intake of the reformulated products, resulting in no change in sugar intake (Langley *et al* 2017). Industries may use a cost shifting strategy of passing more of the tax to smaller beverage package sizes than to the larger packages. Consequently, consumers may choose to purchase larger volumes, which are cheaper per litre (Minton 2016). According to Quirmbach *et al* (2018), an increase in the price of SSBs could either decrease or increase alcohol consumption among all income groups. Therefore, more studies are required to determine how alcohol consumption will be affected by the South African sugar tax (Quirmbach *et al* 2018).

2.3.6.3 Economy

Obesity has direct and indirect economic costs (Sturm, An, Maroba & Patel 2013). In South Africa, moderate obesity results in an 11% increase in health care costs, whereas severe obesity increases health care costs by 23% (Sturm *et al* 2013). Obesity causes an increase in health care expenditure and lower tax revenues, due to unemployment and complications (Duckett & Swerissen 2016). Coca-Cola South Africa (2016) is extremely concerned that an SSB tax will damage the South African economy in return for minimal, as well as uncertain, health benefits. Coca-Cola used the Oxford Economics research to show that about 10 000 jobs in South Africa could be lost due to the sugar tax. However, according to the National Treasury (2016), job losses will be at most 5000. According to Makgetla (2016), the issue of job losses has been exaggerated by Coca-Cola South Africa (2016), as there is an overstatement of the number of jobs which depend on SSB production. Moreover, Coca-Cola South Africa (2016) does not indicate how the figures were arrived at in terms of employment numbers and potential job losses (Makgetla 2016). In addition, it was pointed out that the sugar tax would result in higher societal costs due to unemployment, and could damage the competitiveness of the non-alcoholic beverage (NAB) industry. A 33% decline in the production of SSBs and a R13 billion decline in revenue for producers is expected (Coca-Cola South Africa 2016).

The burden of the tax will affect the poorer population the most, which is the majority of South Africans, as they spend a larger portion of their income on food, when compared to the more affluent (Coca-Cola South Africa 2016; Jeffery 2016). Price increases would affect those who buy in bulk, usually the poorer population in order to save money, and those who sell in bulk.

For example, a 9% price increase would apply to a can of Coke (330 ml), but a 33% price increase would apply to 2 litres of Coke (Jeffery 2016). With this being said, improved health would benefit the poor more than the affluent. Obesity and NCDs result in increased healthcare and transport costs. It also results in lost income for the family, especially if the ill person is the bread winner. Therefore, by reducing obesity and NCDs through the SSB tax, it could provide economic relief for the family (Aluba & Chola 2014).

A sugar tax will affect 'spazas' (a South African term used to define a small, unofficial store in a township, often based in a private house), manufacturers of soft drinks, sugar farmers, suppliers and retail shops negatively, with regards to income and employment (Coca-Cola 2016). As a result, the GDP would decline by R14 billion, or 0.4%. In addition, government revenue from existing personal income tax, corporate income tax and VAT revenues would all be reduced (Coca-Cola 2016). The tax may increase unemployment insurance fund (UIF) payments and all-cause mortality rates (Roelfs, Shor, Davidson & Schwartz 2011). Lastly, it may result in the onset of illegal trade of SSBs in the country (Coca-Cola South Africa 2016).

Government should ensure that South Africa transitions to a healthy society in a cost-effective and economically efficient manner (National Treasury 2016). This means that there should be a balance between decreasing SSB consumption, job creation, economic growth and poverty alleviation. Therefore, it is important to determine the nett effect of the SSB tax (National Treasury 2016). South Africa has a specific health and economic profile and lessons from international experience must be utilised as learning curves (National Treasury 2016).

According to the National Treasury (2016), there will be a redistribution of labour sources in those sectors that are able to absorb additional labour. This is due to the fact that there will be changes to the sectors of employment, investment and trade now that the SSB tax has been implemented. The sectors which may end up with a decline in output because of the SSB tax are: upstream materials, domestic output in agriculture, hunting, forestry and fishing, wholesale, retail, hotels and catering and alcoholic beverages (National Treasury 2016). However, the sectors which may see an increase in output because of the SSB tax are: mining and some manufacturing sectors, transport, construction, quarrying, communication and finance (National Treasury 2016). This indicates that there may be a diversion and redistribution of resources because the money spent on SSBs will be spent on other goods and services (National Treasury 2016).

2.3.7 The impact of a sugar tax in other countries by continent

The SSB tax has been implemented by many governments worldwide (Bedi 2018; Dobbs *et al* 2014). This is because SSBs have been recognised as having no nutritional value and being detrimental to health (Bedi 2018). To date, 28 countries have introduced a sugar tax on foods and drinks high in sugar, while various countries have also considered the proposal of a sugar tax (Bedi 2018). The concept of a SSB tax is relatively new in South Africa, so the lessons learnt from other countries could be useful as a basis of understanding. Therefore, a careful analysis of the failures and successes in the implementation of the SSB tax in other countries, should be conducted (National Treasury 2016).

Because South Africa has its own economic and health profile, one should be careful when basing international SSB tax experience on South Africa's future outcomes (National Treasury 2016). For example, America, New Zealand, and France are different to South Africa because these are developed countries with higher rates of employment (Gumbel 2016). Therefore, the SSB tax implementation did not negatively affect their employment rates. South Africa, on the other hand, is a developing country with high rates of unemployment (National Treasury 2016). If the SSB tax were to have an effect on job losses, developed countries such as these would not struggle as much as South Africa (Gumbel 2016). Overall, the SSB tax has mostly led to a significant decrease in SSB purchases, when considering past international studies (Bedi 2018). In addition, there is a potential significant impact on population health. However, the impact on health strongly depends on the support from the SSB industry (Bedi 2018). The resulting revenue from the SSB tax is also very important. This money should be invested in health as it will not only increase the support from citizens, but also decrease the economic burden of obesity and NCDs (Bedi 2018; Manyema *et al* 2015).

2.3.7.1 Asia

According to the WHO, two out of five adults in the Asian continent are overweight or obese (Manyema *et al* 2015). In addition, half the world's diabetics live in Asia (Manyema *et al* 2015). India implemented a SSB tax on the 1st July 2017, where the cost of SSBs increased by 28%, because SSBs were deemed as harmful products. India has predicted that the SSB tax would reduce obesity by 3% and diabetes by 1.6%, by 2023 (Manyema *et al* 2015).

2.3.7.2 Africa

According to the WHO, obesity is rapidly increasing in Africa due to urbanisation (Manyema *et al* 2015). In addition, obesity among women seems to be more of a problem than among men. This could be due to cultural beliefs that 'obesity equals wealth and health' (Talbot & Pienaar 2012). There is a misconception that obesity only occurs in wealthy populations. According to the WHO, the poorer populations in Africa experience a high double burden of infectious and chronic diseases. This means that NCDs complicate infectious diseases such as HIV and tuberculosis, and vice versa (Manyema *et al* 2015).

St Helena, an island in the African region, has implemented a tax of 0.75 pounds per litre of SSBs since 27 May 2014 (Seedat & Singh 2017). Mauritius, another island in the African region, has implemented a tax of three rupees per 100 gram of sugar content in SSBs, since January 2013 (Seedat & Singh 2017). Further studies are needed in African countries to assess the impact of the SSB tax, including South Africa. This could be due to the fact that the concept is still relatively new (Hofmeyer 2018; National Treasury 2016).

2.3.7.3 Australasia

The New Zealand Ministry of Health Survey of 2016/17 stated that 34% of adults over the age of 15 years were overweight (New Zealand Ministry of Health 2017). In addition, 32% (or 1.2 million) adults were obese. The prevalence of obesity has increased by 3% since the 2011/2012 New Zealand Ministry of Health Survey (New Zealand Ministry of Health 2017). New Zealand has not yet implemented a SSB tax, however, it has been suggested that a 20% SSB tax could reduce energy intake by 0.2% (Mhurchu, Eyles, Genc & Blakely 2014). In addition, deaths from obesity and NCDs could be reduced by 0.2%. It is estimated that the tax could generate 40 million dollars a year, which could be used to improve population health (Mhurchu *et al* 2014).

There is an extremely high prevalence of overweight and obesity in Samoa, hence the need for a SSB tax (Seedat & Singh 2017). The mean BMI for males and females is 31 kg/m² and 34 kg/m², respectively. Furthermore, 46% of the female population is overweight (Seedat & Singh 2017). Sugar-sweetened beverages have been taxed in Samoa since 1984 and the rate is currently 0.4 Samoan Tala per litre (Seedat & Singh 2017). In Tonga, SSBs are taxed at a rate of 1 Tonga Pa'anga per litre since the 14th August 2013. This will hopefully reduce the

prevalence of obesity, which was 48.2% amongst the adult population in 2016 (Seedat & Singh 2017).

2.3.7.4 North America

In the USA, 32.2% and 35.5% of men and women, respectively, are obese (Minton 2016). In 2012, 22% of Americans favoured the SSB tax and in 2013 the tax increased to 35% (Donaldson *et al* 2014). Increased SSB taxation support came from those who had negative attitudes about the SSB industry. They were non-obese, 18 to 19 years of age and had a tertiary education (Donaldson *et al* 2014). The less supportive Americans were those who consumed SSBs regularly. Interestingly, income level was not an indicator of SSB taxation support (Donaldson *et al* 2014).

Only two cities in the USA, i.e. Philadelphia and Berkeley, have implemented an SSB tax (since March 2015) (Gumbel 2016). Oakland and San Francisco, who do not have an SSB tax, have seen a 4% increase in the consumption of SSBs over the period of a year (Dilk & Savaiano 2017). The tax was estimated to raise 90 million dollars during the first year of implementation, however, only 1.5 million dollars was raised by March 2016 (Gumbel 2016). Many more Americans favoured the SSB tax once they became aware that the revenue would be used for health promotion (Myers *et al* 2017).

The SSB tax did not affect the unemployment rate in the USA (Manyema *et al* 2015). If jobs were lost due to the SSB tax, this was offset by employment in the non-beverage industry or government sector (Manyema *et al* 2015). Sixty-two thousand Americans participated in a study which showed that a 10% increase in the cost of SSBs did not affect SSB consumption (Minton 2016). In addition, beer sales increased slightly when SSBs were taxed (Minton 2016). However, the SSB tax implementation efficiently raised awareness of the harmful effects of SSB consumption among Americans. According to Gumbel (2016), the USA proposed that the tax revenue should be used to fund pre-kindergarten facilities, community schools and recreation centers. The money is now being used to fund more than 2000 pre-school classrooms for low-income families (Bedi 2018).

Philadelphia, which proposed a '1.5-3 cents per ounce' soda tax, is considering using the revenue from SSB taxes for universal pre-kindergarten programs and park improvements (Dilk & Savaiano 2017; Minton 2016). In 2012, New York banned the sales of SSB bottles with a volume of more than 500 ml in cinemas, restaurants and sports events (Konwicki 2016).

Although 40% of the New York population is obese and there are more than 6000 deaths per year due to obesity, the ban on SSB sales ended in 2014 (Konwicki 2016). California has implemented a 'penny per fluid ounce' tax on SSBs since 2014, and studies show that more than 100% of the tax was passed onto consumers (Benade & Essop 2017). In addition the consumption of SSBs declined by 21% (Dilk & Savaiano 2017). An increase in the sales of bottled water and tax revenue was also seen (Benade & Essop 2017). Barbados implemented a 10% SSB tax on the 1st August 2015 and the revenue is being used in healthcare (Seedat & Singh 2017). The Dominican Republic implemented a 10% sugar tax on the 1st September 2015, which covers all foods and drinks high in sugar, including sweets and chocolates (Seedat & Singh 2017).

Mexico implemented a SSB tax on the 1st January 2014 and many studies on the SSB tax have been conducted since then (Hashem & Rosborough 2017; Blecher 2015). This is because Mexico is the highest consumer of SSBs and the most obese country in the world. A third of the Mexican adult population is obese and 39.7% are overweight (Hashem & Rosborough 2017). The prevalence of overweight or obesity among pre-school children is 16.7%, while the prevalence of overweight or obesity among school children is 26.2%. In addition, just over a third of the adolescent population is overweight or obese (Hashem & Rosborough 2017). The tax rate had been set at 1 peso per litre and excludes sugar-free beverages (Benade & Essop 2017; Hashem & Rosborough 2017).

According to Blecher (2015) and Guthrie & Esterl (2016), Mexico noted a 10% decrease in SSB purchases, a 13% increase in bottled water purchases and a 0.2% decrease in average daily caloric intake, in the first quarter of 2014. However, 3000 jobs were lost in the same time period (Guthrie & Esterl 2016). The Mexican SSB tax is working as planned because those with a poor socio-economic status have shown the highest decline in SSB purchases (Hashem & Rosborough 2017). After a year of implementation of the Mexican SSB tax, a 6% decline in SSB purchases and a 4% increase in bottled water purchases were seen. Before the start of the second year, a further decline of 12% in SSB purchases was seen (Benade & Essop 2017; Stacey *et al* 2017a). The total revenue raised in 2014 amounted to 1.3 billion dollars (Minton 2016) and was a third more than what was estimated for Mexico (Bedi 2018; Guthrie & Esterl 2016). Although it is recommended that a SSB tax should be set at 20% for the greatest impact, the tax in Mexico is only at 10% (Guthrie & Esterl 2016).

Less than 50% of the Mexican population was in favour of the SSB tax after its implementation (Myers *et al* 2017). After being informed that the tax revenue would be used to fund obesity prevention programs and to provide clean water in schools, this number increased to 70% of the population (Myers *et al* 2017). Another survey was done on 8000 households, before and after the implementation of the SSB tax, to determine the purchasing behaviours with regards to SSBs (Minton 2016). The study revealed that those with a low income were least likely to reduce their SSB purchases after the implementation of the SSB tax. This may be because they see it as a luxury and are not willing to give it up. From this, it is evident that the poorer population is paying more towards the tax than the wealthier population. In addition, homes with an 'obese head' were least affected by the tax, even though the tax was directed at them (Minton 2016).

2.3.7.5 South America

The prevalence of obesity among adults in Columbia was 16.4% in 2005 and rose to 19.9% in 2010 (Dilk & Savaiano 2017). Due to this, a soda tax was implemented on SSBs sold at stores and in vending machines (Dilk & Savaiano 2017). In Chile, 65.3% of adult citizens were overweight or obese in 2007 (Seedat & Singh 2017), and a SSB tax was implemented in January 2015. If an SSB contains more than 6.25 g of sugar per 100 ml in Chile, it is taxed at 13-18%. If an SSB contains less than 6.25 g of sugar per 100 ml, it is taxed at 10% (Seedat & Singh 2017).

2.3.7.6 Europe

In the UK, a quarter of the adult population was obese in 2008 (Konwicki 2016). Since 1991, the prevalence of obesity increased by 65% for men and 25% for women (Konwicki 2016). The SSB tax was implemented in the UK in 2018 at a rate of 18 to 24 pence per litre. If an SSB contains more than 5 g of sugar per 100 ml, then the SSB is taxed at 18 pence per litre. If an SSB contains more than 8 g of sugar per 100 ml, then the SSB is taxed at 24 pence per litre (Seedat & Singh 2017; Konwicki 2016). Although the UK SSB tax costs 1 billion pounds to implement, it is expected to raise 520 million pounds worth of revenue in the first year. The revenue is to be used for sport funding in schools, promoting physical education, healthy eating programmes and breakfast clubs. Therefore, the aim of the SSB tax is not to increase revenue, but rather, to promote a healthy and active lifestyle among children (Bedi 2018; Konwicki 2016). It has been estimated that the 20% of the UK SSB tax has thus far reduced obesity by 1.3% (180 000 people) and overweight by 0.9% (Manyema *et al* 2015; Mhurchu *et al* 2014;

Briggs *et al* 2013). In addition, the greatest effect of obesity and overweight reduction has been seen in those who are younger (Briggs *et al* 2013).

Denmark repealed its SSB tax in 2014 after deeming it ineffective and detrimental to the economy (Benade & Essop 2017). However, Denmark had been taxing unhealthy consumables since the 1930s (Seedat & Singh 2017). Many people switched to cheaper SSBs and partook in cross-border shopping after the tax was implemented (Seedat & Singh 2017; Konwicki 2016). With this being said, the latest SSB tax rate was fixed at 0.22 Danish Krone per litre. This raised about 60 million Danish Krones per year; however, 5000 jobs were lost thereafter (Seedat & Singh 2017).

In France, the SSB tax was implemented in January 2012 at a rate of 7.16 Euros per 100 litres (Julia, Méjean, Vicari, Péneau & Hercberg 2015). Citizens who were most in favour of the SSB tax were older, possibly because they were more health conscious. Those who were less in favour of the SSB tax had lower education levels. With this being said, 57.7% of citizens were in favour of the SSB tax. This value increased to 72.7%, once they knew that the revenue would be used to promote health (Julia *et al* 2015). The SSB industry was highly resistant to the SSB tax (Manyema *et al* 2015). Overall, a decrease in the consumption of SSBs was seen; however, the long-term impact on health status is unknown. This suggests that more people are likely to be in favour of the SSB tax, if the revenue is used for health promotion (Briggs *et al* 2013).

In Ireland, a 10% tax rate reduced obesity prevalence by 1.3% and overweight by 0.7% (Manyema *et al* 2015; Mhurchu *et al* 2014). Although the consumption of SSBs decreased, the long-term health impacts are unknown (Briggs *et al* 2013). Belgium implemented a tax on SSBs at a rate of 0.068 Euros per litre on the 1st January 2016 (Seedat & Singh 2017). Finland implemented a tax on candy and SSBs in 2011. However, it was scrapped in 2017 because not all high sugar products fell within the tax net and thus, some products became more expensive to produce (Seedat & Singh 2017). Hungary has a SSB tax at a rate of 0.24 dollars per litre since 2011. In addition, Hungary taxes high salt, sugar and caffeine products. However, resistance from the SSB industry had made the taxation process quite difficult (Seedat & Singh 2017; Manyema *et al* 2015).

2.3.8 The need for further studies on the South African sugar-sweetened beverage tax

After a thorough review of the literature, it is evident that there are a number of issues regarding the South African SSB tax that requires further research. Before undertaking research regarding this newly implemented tax, one needs to identify the cost effectiveness and potential impact of interventions to reduce obesity (Dobbs *et al* 2014). The main reason for the implementation of the SSB tax is to combat obesity. In order to do this, holistic assessments of what an integrated strategy for overcoming obesity would be, should be documented (Dobbs *et al* 2014).

Once the factors regarding obesity in SA have been established, the effects of the SSB tax can be determined (Benade & Essop 2017). Therefore, well designed, long-term studies to determine the impacts of the SSB tax in South Africa, are needed (Le Bodo & Dewals 2018; ADSA 2017; Benade & Essop 2017; Stacey *et al* 2017b; Cabrera Escobar *et al* 2013). In order to determine the impact of the SSB tax, a number of data elements for South Africa are required. The data elements required to evaluate the implementation of the SSB tax are:

- The sugar-sweetened beverage sales amounts, before and after the implementation of the SSB tax.
- The sugar-sweetened beverage consumption trends, before and after the implementation of the SSB tax.
- The changes in dietary patterns due to the SSB tax. For example, researchers need to determine whether purchasing behaviours are leaning towards high fat and high energy alternatives.
- The impacts of the SSB tax on economics. These factors include; job losses, GDP increases or decreases, savings to the health care sector, revenue for the government and implementation costs.
- The consumer reactions to the SSB tax. This type of study should include factors such as public knowledge, acceptability, feasibility and attitudes towards the SSB tax.
- The ultimate goal, which is to determine the impact of the SSB tax on obesity, NCDs, daily energy balance and life expectancy should be an on-going research process.

(Le Bodo & Dewals 2018; ADSA 2017; Benade & Essop 2017; Donaldson *et al* 2014; Manyema *et al* 2014; Cabrera Escobar *et al* 2013).

Research on the behavioral effects of sin taxes in South Africa are lacking (Talbot & Pienaar 2012). Full cost-effectiveness studies should be conducted to ensure that strong evidence is available to policy makers for efficient decision-making procedures (Cabrera Escobar *et al* 2013). Such studies should include data values which are specific to the country and its sub-regions. In addition, the studies should be undertaken with an adequate understanding of context-specific policies, history and socio-cultural preferences (Cabrera Escobar *et al* 2013).

2.4 Conclusion

Obesity rates in South Africa have increased drastically over the years. Given that SSBs are one of the main contributors to obesity due to their high sugar and energy content, the South African government implemented a SSB tax in April 2018 to address the problem. Beverages to be taxed include soft drinks, fruit drinks, sports/energy drinks, vitamin water drinks, sweetened ice tea and lemonade. Unsweetened milk and a 100% fruit juice are exempt from the tax as they contain intrinsic sugars (not added sugar). Artificially sweetened beverages are also exempt, as they do not contain caloric sweeteners. The SSB tax is fixed at 2.1 cents per gram of the sugar content in a SSB that exceeds 4 g per 100 ml (the first 4 g per 100 ml are tax free). Studies in other countries have shown that increased prices of SSBs have led to a decrease in consumption. However, in South Africa, the outcomes on health and the impact on the country and consumer reactions are unknown. Therefore, this study aimed to assess awareness, attitudes and response to the SSB tax among consumers in Pietermaritzburg, KwaZulu-Natal.

CHAPTER 3: METHODOLOGY

This chapter presents the study design, study population, sample selection, study methods and materials, data collection, pilot study, statistical analysis, data quality and control, reliability, validity and ethical considerations of the study.

3.1 Study design

This study aimed to assess the awareness, attitudes and response to the sugar-sweetened beverage tax among consumers in Pietermaritzburg, KwaZulu-Natal. Data collection for an observational cross-sectional study was conducted between September and October 2018. Qualitative research is a scientific method of observation, used to gather non-numerical data (Babbie 2014, p303). It focuses on the human elements of social and natural sciences. In addition, qualitative research aims to determine concepts, definitions and characteristics of the sample population. Therefore, an in-depth understanding of human behaviour, and the reason behind it, can be evaluated (Babbie 2014, p303).

A cross-sectional study is used to determine prevalence, infer causation and identify associations (Mann 2003). Many of these types of studies include questionnaires and interviews. They are quick and easy to use within a short space of time. It is also cheap because there is no follow-up and fewer resources are required. In addition, multiple outcomes can be researched at once. However, differentiating between cause and effect is difficult and it provides weaker evidence than a cohort study (Mann 2003).

3.2 Study population and sample selection

The study population consisted of adults, 18 years or older, of diverse races, males and females and varied socioeconomic status living in Pietermaritzburg, who spoke and understood English. The sample was selected from the shopping malls/centres who gave permission to conduct the study at their premises. The shopping centres in Pietermaritzburg who gave permission for the study to be conducted there, included: Truro Plaza (Bombay Heights), Laager Centre (Central Pietermaritzburg), Derby Place (Northdale), Victoria Centre (Central Pietermaritzburg), Scottsville Mall (Scottsville), Southgate Mall (Bisley) and Cascades Centre (Chase Valley). Consumers had to be 18 years or older to participate because this is the legal age at which individuals are able to make their own purchasing decisions (Department of Economic and Social Affairs 2012). The study aimed to determine the consumer awareness,

attitudes and response to the South African SSB tax. This was a convenience sample and was not representative of all gender and race groups.

The city of Pietermaritzburg was chosen because it is an urban area (Statistics South Africa 2011). Urban areas often consist of a variety of shopping centres, as they accommodate the economic levels of the residents (Department of Economic and Social Affairs 2012). The level of knowledge is generally higher among urban residents when compared to rural residents (Department of Basic Education 2016). One of the inclusion criteria for this study was that the participants had to understand and speak English. In general, urban residents are more likely to understand English, when compared to rural residents. Languages such as isiZulu, for example, are more predominant in rural areas (Department of Basic Education 2016). Although the SSB tax is targeted at the entire population, more consumers of SSBs are likely to be found in urban areas, when compared to rural areas (Ronquest-Ross, Vink & Siggs 2015). Compared to an informal rural or formal rural area, people residing in urban areas are more likely to afford SSBs (Daniels, Partridge, Kekana & Musundwa 2013). They also have better access to shopping centres and have the means for purchasing, such as adequate transport. Furthermore, they are more likely to have fridges to keep SSBs cold (Daniels *et al* 2013).

3.3 Study methods and materials

3.3.1 Questionnaire

In this study, data regarding demographics, awareness of the SSB tax and response to the SSB tax was obtained through a self-administered questionnaire (Appendix A). It is important for a questionnaire to be well-designed so that it can be optimally used for its purpose (Youngshin, Youn-Jung & Doonam 2015). The questionnaire developed for this study consisted of three sections. Section A consisted of 18 questions and was used to determine the consumers' demographic characteristics and awareness of the SSB tax. It covered age, race, education qualifications and medical diagnoses of the consumers. Thereafter, the questionnaire enquired about financial factors such as income, money spent on food and SSBs. Section A also determined how many people lived in the household and who was responsible for grocery purchases. After this, the questionnaire determined whether or not the consumer consumed SSBs. If they indicated that they did, they were then asked how often they purchased SSBs, reasons for purchasing SSBs, preferred settings for the consumption of SSBs, factors which they considered when purchasing SSBs and how important SSBs were to them. Finally, section A determined whether or not the consumer was aware of what the sugar tax was and when it

was implemented. Section B aimed to determine the attitudes of the consumers towards the SSB tax, and whether or not the consumer was in favour of the SSB tax. It also asked what they thought the money generated from the SSB tax should be used for. Section C aimed to determine the consumers' response to the SSB tax. The consumer was asked to indicate their response to the SSB tax in terms of their purchasing behaviour. The consumer was also asked which alternatives they would consider buying if the SSBs were no longer affordable to them. Finally, the consumer was given the opportunity to write down the approaches they thought that the government should implement, in order to reduce the obesity rates in the country.

According to Youngshin *et al* (2015), self-administered questionnaires are the most popular types of questionnaires in studies involving surveys. The positive aspects of a self-administered questionnaire are that they are completed in a standard manner, easy to implement, cost-effective and protect confidentiality. The negative aspects of a self-administered questionnaire is that researchers often experience the issue of non-response from participants (Youngshin *et al* 2015). All questionnaires should contain a combination of open- and closed-ended questions for in-depth results. Open-ended questions allow participants to elaborate on their own perspectives and are easy to construct, however, it may be difficult to analyse. Although closed-ended questions are difficult to construct, they minimise bias, allow for comparison and quantification and are easy to administer and analyse (Youngshin *et al* 2015).

The following systematic steps were followed during the design of the questionnaire used in this study:

- Identify the hypothesis of the research problem.
- Identify the information needed to test the hypotheses.
- Identify the information needed for the logistics of the study and to examine confounding factors.
- Write down the questions that will be needed to collect this information.
- Using a questionnaire, format and organise the questions.
- Pilot the questionnaire on respondents with the same characteristics as those who will be selected for the survey.
- Revise the questionnaire.
- Train fieldworkers to administer the questionnaire (Youngshin *et al* 2015).

According to Youngshin *et al* (2015), the researcher should give special attention to certain aspects when designing a questionnaire. If it is done efficiently and effectively, valid responses from participants will be given in return. After all, the purpose of the research tool is to obtain accurate relevant information from participants and to maximise the response rate for the study (Youngshin *et al* 2015). The following aspects were taken into consideration for the development and validation of the questionnaire (Youngshin *et al* 2015):

- Ensure that the questionnaire is readable (i.e. font type and font size).
- Ensure that the questionnaire is worded well (i.e. grammar and spelling) and do not use slang, jargon or abbreviations.
- The reading levels of the tool must match the educational level of the participants.
- Keep the questions short and simple.
- Positive and negative responses should be included.
- Avoid ambiguous and invasive questions.
- Each question must contain a single idea and double negatives should be avoided.
- The questionnaire must be sequenced in a logical order and there should be a smooth transition from one idea to the next.
- Controversial or emotive questions should be placed at the end of the questionnaire.
- The response styles should be appropriate for the question at hand.
- The questionnaire must not be too long for the participants to answer.
- The questionnaire should be reproducible.

3.3.2 Data collection

Seventeen shopping centres were approached to participate in the study. These included: Edendale Mall, Liberty Midlands Mall, Hayfields Mall, Laager Centre, Northway Mall, Derby Place, Truro Plaza, Southgate Mall, Victoria Centre, Selgro Centre, Mayor's Walk, Parklane Centre, Wembley Centre, Polly Shorts, Victoria Centre, Cascades and Scottsville Mall. These shopping centres were located on Google Maps as the largest in Pietermaritzburg. Only seven out of the 17 shopping centres that were approached to participate in the study, gave permission. These included: Victoria Centre, Cascades, Truro Plaza, Derby Place, Southgate Mall, Scottville Mall and Laager Centre.

The researcher created an information sheet on the SSB tax. This was to be used together with the questionnaire. A question in the questionnaire asked: 'are you aware of the sugar tax?' If the consumer responded with 'no', the information sheet was given to them, before they proceeded with answering the questionnaire. One research assistant was trained to assist with data collection. This was done by explaining the purpose of the study and procedures to be followed during data collection. The research assistant conducted data collection during the pilot study and the researcher was able to observe and guide the research assistant through the data collection process.

Once the researcher and research assistant arrived at each shopping centre, the management team of the centre was greeted. The management team then proceeded to allocate a data collection area for the researcher to use. At the data collection area, the researcher laid out a large table with chairs for consumers to sit on, while they answered the questionnaire. A UKZN banner and table cloths were used at the data collection area to associate the research with UKZN. After setting up, the researcher randomly approached consumers to explain the reason for the study and invite them to participate. Those who agreed to participate were first given a participant information sheet on the study and consent form (Appendix B). Only after the consent form was signed and returned, did the consumer receive the questionnaire and information sheet on the SSB tax. The SSB tax information sheet was given to those who were not aware of the SSB tax. The researcher and research assistant were available during data collection to answer queries and assist those who needed help. Once the consumer completed the questionnaire, the researcher checked if any questions were omitted. Some of the consumers were willing to go back and answer the omitted questions, while others were not. However, all questionnaires were analysed regardless of missing data. At the end of the process, the consumers were thanked for their participation.

3.4 Pilot study

Pilot studies are mini-versions of a full scale study and tests a research instrument, such as a questionnaire (Arain, Campbell, Cooper & Lancaster 2010). In addition, pilot studies allow for detection of flaws in the questionnaire design. Although pilot studies can be costly, they avoid wasted efforts on questions which would have produced unquantifiable responses and uninterpretable results (Arain *et al* 2010). Pilot studies supply information regarding errors and where improvement can be made, so that the main study can be conducted more accurately (Arain *et al* 2010). According to Hertzog (2008), sample sizes for pilot studies that have

between 10 and 40 participants provide estimates which are precise enough to achieve the aim of the pilot study.

The pilot study was conducted in Fairways on Main Mall in Howick before the main study and included 16 consumers. The finding of the pilot study was that the questionnaire was well understood and easy to understand. In addition, the process of administering the questionnaires worked smoothly. However, a few minor challenges were experienced by the researcher. Firstly, it was quite difficult to recruit consumers. However, the researcher found that the ability to engage with consumers improved with time. Secondly, it was noted that some questions were not answered. Finally, question 17 followed by stating that if the consumer is unaware of the sugar tax, he or she should 'notify the researcher'. This was changed to read that he or she should 'please read the note provided'. This change was made as consumers failed to follow the instruction. Apart from this minor change, no other changes were made to the questionnaire.

3.5 Statistical analysis

Data from the questionnaires was entered onto a Microsoft Excel 2010 spreadsheet. The IBM Statistical Package for Social Science (SPSS) Version 23.0 was used to analyse the data. Each of the objectives involved descriptive statistics. This included means and standard deviations, where applicable. Frequencies were represented in tables or graphs. Binomial tests were applied to determine whether a significant proportion of respondents selected one of two possible responses. This could be extended when data with more than two response options was split into two distinct groups. A one-sample t-test was used to test whether a mean score was significantly different from a scalar value. A Chi-square test of independence was used on cross tabulations to determine whether a significant relationship existed between two variables represented in the cross-tabulation. When conditions were not met, the Fisher's exact test was used. A Chi-square goodness-of-fit test was used on categorical variables to test whether any of the response options were selected significantly more or less often than the others. Under the null hypothesis, it was assumed that all responses were equally selected. A Wilcoxon Signed Ranks test was used to determine whether the average value was significantly different from a value of three (the central score). This was applied to Likert scale questions. It was also used in the comparison of the distributions of two variables. A p-value of less than 0.05 was considered to be statistically significant.

3.6 Validity and reliability

3.6.1 Validity

Validity refers to the degree to which the research conclusions are sound (Terre Blanche, Durrheim & Painter 2006, p152). The researcher ensured that the research assistant was trained prior to the start of data collection. The purpose of the study was explained to the research assistant. Following this, the researcher allowed the research assistant to participate in the pilot study as if she were a participant herself (a mock questionnaire and participant form was used). In this way, the research assistant had exposure to conducting data collection. Thereafter, the researcher was able to clarify any misunderstanding, enabling the research assistant to have a thorough understanding of the questions in the questionnaire. In addition, the researcher supervised the research assistant at all times.

A questionnaire is validated to ensure that it will accurately measure what it intends to measure (Kazi & Khalid 2012). A valid questionnaire enables one to obtain better quality data with high comparability, thereby reducing the effort and increasing the credibility of the data (Kazi & Khalid 2012). The questionnaire for the study was designed to be simple and viable. Care was taken to ensure that the wording of the questions was precise. Furthermore, the researcher ensured that the questionnaire was adequate for the objectives it intended to answer and reflected the underlying theory (Kazi & Khalid 2012). This was done by reviewing literature and isolating the most needed study questions. These were then incorporated into the questionnaire. Finally, the questionnaire was designed in a manner that would allow the capability of measuring change (Kazi & Khalid 2012). This was achieved by including both open-ended and closed-ended questions. The questionnaire was validated by a statistician and the study supervisor, who checked that the questionnaire met the study objectives, that there was a logical flow with the questions and that there were no leading, ambiguous or confusing questions.

3.6.2 Reliability

Reliability refers to the dependability of a measurement instrument; that is, the extent to which the instrument yields the same results on repeated trials (Terre Blanche *et al* 2006, p90). The same questions were asked to all consumers. In addition, the questions were standardised and all asked in the same manner.

3.7 Data quality control

Once the researcher had captured the data onto a Microsoft Excel spreadsheet, it was cross-checked by the research assistant. In addition, the statistician checked the spreadsheet for errors and gave feedback to the researcher before analysing the data.

3.8 Ethical considerations

This study was given full ethics approval by the University of KwaZulu-Natal, Humanities and Social Science Research Ethics Committee (HSSREC) (Reference number: HSS/0899/018M) (Appendix C). All consumers were given a consent form (Appendix B) to read and sign before filling in the questionnaire. The consent form outlined the aims, purposes and procedures of the study. It also explained that no harm would be inflicted on consumers and that they would remain anonymous. In addition, it stated that they were free to withdraw at any stage, without penalties. Consumers were also encouraged to ask questions if they did not understand anything or if they needed clarification regarding the information on the consent form. Those who needed clarification were attended to individually by the researcher or research assistant. Data collection only commenced once the consumer had signed the consent form.

CHAPTER 4: RESULTS

Chapter 4 presents and describes the results of the study.

4.1 Demographic characteristics of the consumers

Table 4.1 displays the demographic characteristics of the consumers.

Table 4.1: Demographic characteristics of the consumers (n=394)

Characteristic	Category	n (%)
Age (years) (n=394)	18-30	180 (45.7)
	31-50	144 (36.5)
	51-70	63 (16.0)
	> 70	5 (1.3)
Race (n=394)	White	39 (9.9)
	African	163 (41.4)
	Indian	168 (42.6)
	Coloured	18 (4.6)
	Other	4 (1.0)
Education level (n=394)	No formal education	3 (0.8)
	Grade 11 or less	75 (19.0)
	Matric	170 (43.1)
	College	53 (13.5)
	Technikon	39 (9.9)
	University	51 (12.9)
Diagnosed medical condition [a]	Diabetes	32 (8.1)
	High blood pressure	60 (15.2)
	High cholesterol	21 (5.3)
	Overweight or obesity	9 (2.3)
	Other	39 (9.9)
	No medical condition	277 (70.3)

[a] Consumers could indicate more than one medical diagnosis, therefore percentages do not add up to 100%

The largest group of consumers were between the ages of 18-30 years old (45.7%; n=180), followed by 31-50 years old (36.5%; n=144). The sample consisted of nearly equal amounts of Indian (42.6%; n=168) and African (41.4%; n=163) consumers. White, Coloured and

‘Other’ consumers made up 9.9% (n=39), 4.6% (n=18) and 1.0% (n=4) of the sample, respectively. The largest portion of the sample held a matric certificate only (43.1%; n=170), just under 1% (n=3) had no formal education, while 12.9% (n=51) held a university qualification. The majority of the sample had not been diagnosed with any chronic medical conditions (70.3%; n=277). However, high blood pressure was the most common medical diagnosis among the sample (15.2%; n=60), followed by diabetes (8.1%; n=32). The least common medical diagnosis was overweight or obesity (2.3%; n=9). Thirty-nine consumers (9.9%) indicated ‘other’ as a medical diagnosis. This consisted of diseases such as cancer (n=1), asthma (n=1), polycystic ovarian syndrome (n=1), heart failure (n=1), tuberculosis (n=1) and arthritis (n=1). The remaining consumers (n=33) did not divulge their medical conditions (Table 4.1).

Table 4.2 displays the household expenditure characteristics of the consumers.

Table 4.2: Household expenditure characteristics of the consumers

Characteristic	Category	n (%)
Number of people living in the household (n=394)	Live alone	26 (6.6)
	Two-three	145 (36.8)
	Four-five	149 (37.8)
	Six or more	70 (17.8)
Total monthly household income (n=394)	R0-R10 000	145 (36.8)
	R10 001-R20 000	63 (16.0)
	R20 001-R30 000	40 (10.2)
	R30 001-R40 000	34 (8.6)
	More than R40 000	22 (5.6)
	I do not know	88 (22.3)
Consumer purchases groceries (n=394)	Yes	245 (62.2)
	No	148 (37.6)
Person who purchases the groceries (n=148)[a]	Parent (s)	88 (59.5)
	Grandparent (s)	11 (7.4)
	Sibling (s)	8 (5.4)
	Aunt/uncle (s)	1 (0.7)
	Friend	4 (2.7)
	Spouse or partner	28 (18.9)
	Other	5 (3.4)
Money spent on food per month (n=245)[a]	Less than R500	12 (4.9)
	R501-R1 000	41 (16.7)
	R1 001-R1 500	63 (25.7)
	R1 501-R2 000	43 (17.6)
	R2 001-R2 500	28 (11.4)
	More than R2 500	56 (22.9)
Money spent on sugar-sweetened beverages per month (n=245)[a]	R0-R100	105 (42.9)
	R101-R200	74 (30.2)
	R201-R300	30 (12.2)
	More than R300	33 (13.5)

[a] Some consumers did not answer

Only 6.6% (n=26) of the consumers lived alone, while nearly equal amounts of consumers had two-three (36.8%; n=145) or four-five (37.8%; n=149) people living in the household, including themselves. Just over 22% (n=88) of consumers did not know what the total monthly household income was, while 36.8% (n=145) had a total monthly household income of R0-R10 000. There seemed to be a decrease in the number of respondents as the income brackets increased. To further elaborate, 16.0% (n=63) indicated a total monthly household income of R10 001-R20 000, 10.2% (n=40) indicated R20 001-R30 000, 8.6% (n=34) indicated R30 001-R40 000 and 5.6% (n=22) indicated more than R40 000. A significant number (62.2%; n=245) indicated that they were responsible for purchasing the monthly groceries ($p<0.0005$). For those who did not do the shopping, a significant number indicated that it was done either by parents (59.5%; n=88) or spouse/partners (18.9%; n=28) ($p<0.0005$). Just under 5% (n=12) spent R500 or less on food per month, while 25.7% (n=63) spent R1 001-R1 500 and 22.9% (n=56) spent more than R2 500. Most consumers indicated that they spent between R0-R100 on SSBs per month (n=105; 42.9%), followed by R101-R200 per month (30.2%; n=74). Nearly equal amounts of consumers indicated that they spent between R201-R300 (12.2%; n=30) and more than R300 (13.5%; n=33) on SSBs per month.

Figure 4.1 indicates the number of consumers who consumed sugar-sweetened beverages and those who did not.

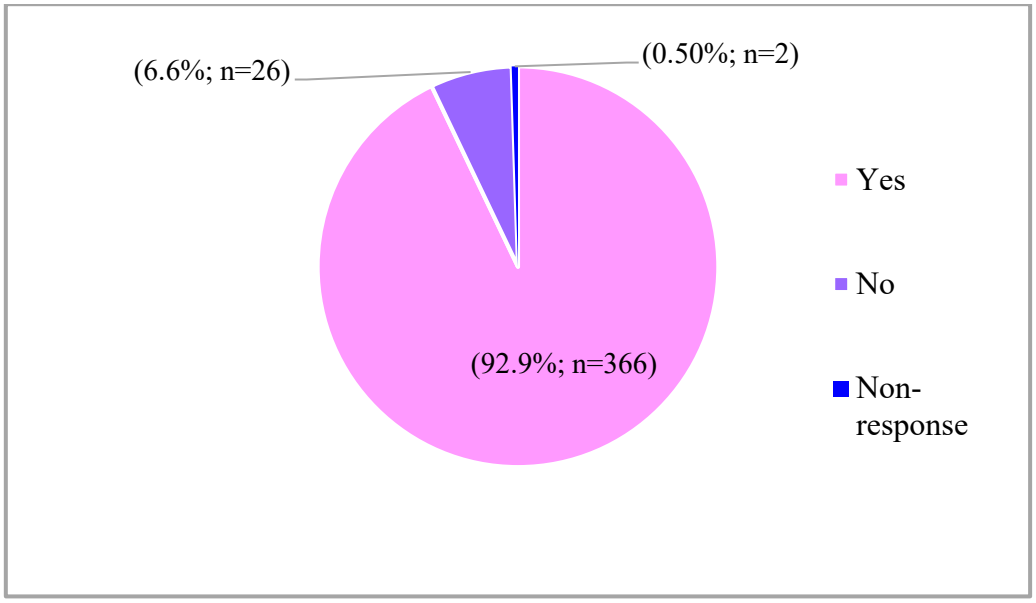

Figure 4.1: Indication of consumers who consumed sugar-sweetened beverages versus those who did not (n=394)

A binomial test showed that a statistically significant number (92.9%; n=366) reported that they consumed SSBs such as soft drinks, fruit drinks, sports drinks, energy drinks, vitamin water, sweetened ice tea and/or lemonade ($p<0.0005$).

Table 4.3 shows how often the consumers consumed sugar-sweetened beverages.

Table 4.3: Frequency of sugar-sweetened beverage consumption (n=366)

Sugar-sweetened beverages	0 times a week	one-two times a week	three-four times a week	five-six times a week	Every day
	n (%)				
Soft drinks (e.g. Fanta, Coke, Sprite)	34 (9.3)	180 (49.2)	69 (18.9)	18 (4.9)	33 (9.0)
Sports/energy drinks (e.g. Energade, Powerade)	91 (24.9)	112 (30.6)	22 (6.0)	20 (5.5)	23 (6.3)
Squashes (e.g. Oros, Jungle Yum, Halls)	106 (29.0)	81 (22.1)	30 (8.2)	12 (3.3)	19 (5.2)
Iced tea	167 (45.6)	51 (13.9)	10 (2.7)	4 (1.1)	5 (1.4)
Vitamin water	154 (42.1)	51 (13.9)	13 (3.6)	7 (1.9)	12 (3.3)
Other sugar-sweetened beverages	86 (23.5)	71 (19.4)	30 (8.2)	8 (2.2)	20 (5.5)

Results from a chi-square goodness-of-fit test showed that a significant number (49.2%; n=180) indicated that they consumed soft drinks 1-2 times a week ($p<0.0005$), and a significant number (55.5%; n=203) indicated that they consumed sports/energy drinks at most 1-2 times a week ($p<0.0005$). Squashes were consumed at most 1-2 times a week by 187 (51.1%) respondents ($p<0.0005$). Iced tea (45.6%; n=167) and vitamin water (42.1%; n=154) were the least consumed on a weekly basis ($p<0.0005$). Lastly, a significant number (42.9%; n=157) indicated that they consumed other SSBs at most 1-2 times a week ($p<0.0005$). The other SSBs were identified as tea/coffee (n=6), fruit juice (n=8), alcohol (n=3) and flavoured water (n=3).

The reasons for purchasing sugar-sweetened beverages are shown in Table 4.4

Table 4.4: Reasons for purchasing sugar-sweetened beverages (n=366)

Reasons for purchasing sugar-sweetened beverages	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Mean agreement score	p-value
	n (%)						
I have it as a drink option when going out, instead of alcohol (e.g. at restaurants/family events)	40 (10.9)	18 (4.9)	68 (18.6)	130 (35.5)	74 (20.2)	3.55	p<0.0005
I enjoy the taste	13 (3.6)	10 (2.7)	43 (11.7)	178 (48.6)	79 (21.6)	3.93	p<0.0005
To quench my thirst in hot weather	21 (5.7)	23 (6.3)	53 (14.5)	156 (42.6)	67 (18.3)	3.70	p<0.0005
My family/friends like to drink it	16 (4.4)	41 (11.2)	63 (17.2)	136 (37.2)	45 (12.3)	3.51	p<0.0005
'It completes a meal'	38 (10.4)	57 (15.6)	73 (19.9)	95 (26.0)	44 (12.0)	3.16	p=0.022
I grew up drinking it; it is difficult to stop now	64 (17.5)	97 (26.5)	52 (14.2)	66 (18.0)	23 (6.3)	2.63	p<0.0005
I use it for mixing with alcohol	111 (30.3)	77 (21.0)	43 (11.7)	57 (15.6)	13 (3.6)	2.28	p<0.0005
It boosts my energy levels and keeps me alert	49 (13.4)	81 (22.1)	59 (16.1)	89 (24.3)	31 (8.5)	2.91	p=0.206

A one sample t-test was applied to test if the average agreement score was significantly different from a neutral score of three (3). A significant result, where the mean value is greater or less than three (3) implies agreement/disagreement, respectively. There was significant agreement that the following were reasons why SSBs were purchased: I have it as a drink option when going out, instead of alcohol (e.g. at restaurants/family events); I enjoy the taste; to quench my thirst in hot weather; my family/friends like to drink it; 'It completes a meal'.

There was significant disagreement that the following were reasons for purchasing SSBs: I grew up drinking it; it is difficult to stop now; I use it for mixing with alcohol. There was neither significant agreement nor significant disagreement that they bought SSBs because it boosted their energy levels and kept them alert.

Reasons for the consumption of sugar-sweetened beverages in various settings are shown in Table 4.5.

Table 4.5: Reasons for the consumption of sugar-sweetened beverages in various settings (n=366)

Setting	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Mean agreement score	p-value
	n (%)						
At home	16 (4.4)	36 (9.8)	69 (18.9)	167 (45.6)	52 (14.2)	3.60	p<0.0005
At work or varsity	26 (7.1)	32 (8.7)	73 (19.9)	139 (38.0)	40 (10.9)	3.44	p<0.0005
Family 'get together'/parties/braais/ weddings	15 (4.1)	11 (3.0)	29 (7.9)	176 (48.1)	91 (24.9)	3.98	p<0.0005
At restaurants/ take-aways	16 (4.4)	14 (3.8)	49 (13.4)	166 (45.4)	72 (19.7)	3.83	p<0.0005
During/after sports/gym	29 (7.9)	65 (17.8)	55 (15.0)	104 (28.4)	41 (11.2)	3.21	p=0.003
A day out (e.g. park/beach)	15 (4.1)	9 (2.5)	44 (12.0)	176 (48.1)	69 (18.9)	3.88	p<0.0005

Results from a one sample t-test showed that the following were significant settings in which SSBs were consumed: At home; at work or varsity; family 'get together'/ parties/braais/weddings; at restaurants/take-aways; during/after sports/gym; a day out (e.g. park/beach) (p<0.0005).

Table 4.6 outlines how important the following factors were to consumers when purchasing SSBs, on a scale from 1 (not at all important) to 5 (very important).

Table 4.6: Important factors considered when purchasing sugar-sweetened beverages (n=366)

Factors	Not at all important 1	2	3	4	Very important 5	Mean agreement score	p-value
	n (%)						
The price	47 (12.8)	34 (9.3)	45 (12.3)	28 (7.7)	183 (50.0)	3.79	p<0.0005
The brand	30 (8.2)	30 (8.2)	37 (10.1)	46 (12.6)	180 (49.2)	3.98	p<0.0005
The sugar content	65 (17.8)	46 (12.6)	55 (15.0)	32 (8.7)	123 (33.6)	3.32	p<0.0005
The taste	15 (4.1)	11 (3.0)	31 (8.5)	51 (13.9)	220 (60.1)	4.37	p<0.0005
The advertisements for the product	108 (29.5)	39 (10.7)	54 (14.8)	28 (7.7)	85 (23.2)	2.82	p=0.049
The design and packaging of the product	101 (27.6)	33 (9.0)	61 (16.7)	33 (9.0)	90 (24.6)	2.93	p=0.446
Pressure from other people	199 (54.4)	30 (8.2)	25 (6.8)	9 (2.5)	46 (12.6)	1.94	p<0.0005

A one sample t-test indicated that the following were statistically significant factors considered when purchasing SSBs: the price; the brand; the sugar content and the taste ($p<0.0005$). The advertisements for the product ($p=0.049$) and pressure from other people ($p<0.0005$), were not significantly important factors considered when purchasing SSBs.

Figure 4.2 indicates how important sugar-sweetened beverages were to the consumers.

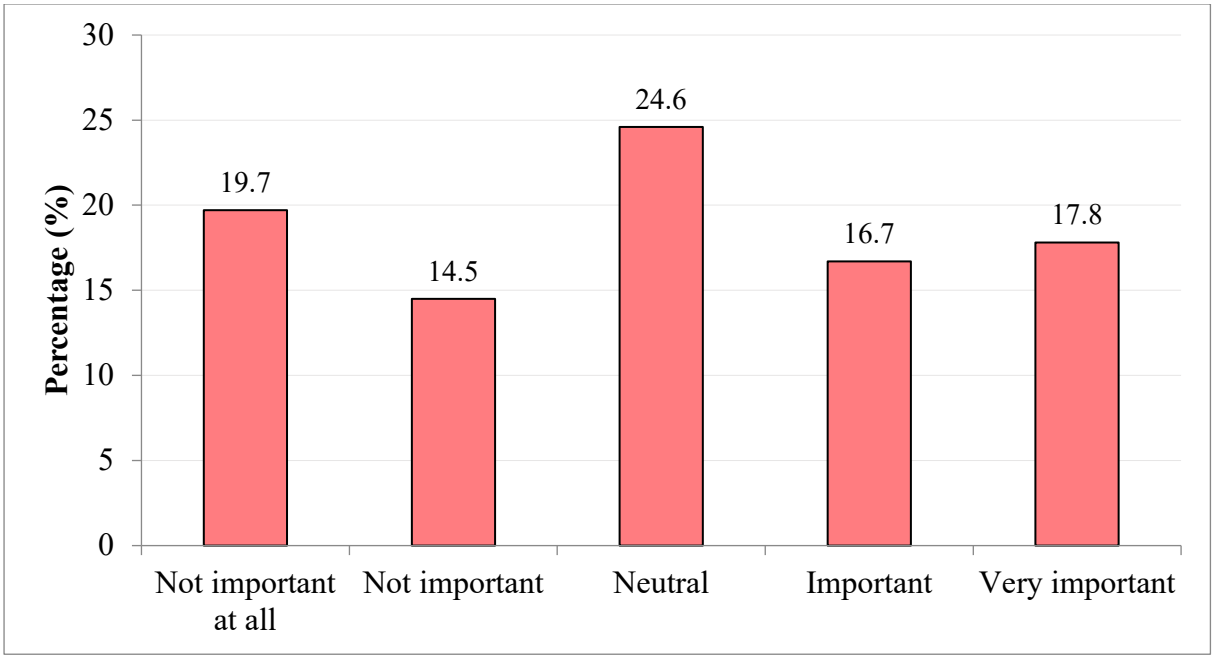

Figure 4.2: Importance of sugar-sweetened beverages to the consumers (n=366)

Most consumers (24.6%; n=90) gave a neutral response when asked about how important SSBs were to them. Nearly 18% (n=65) felt that SSBs were very important to them, while 19.7% (n=72) felt that SSBs were not important at all. A one-sample statistical test indicated that there was no consensus on the importance of SSBs to consumers.

4.2 Awareness of the sugar-sweetened beverage tax among consumers

Figure 4.3 indicates whether consumers were aware of the SSB tax or not.

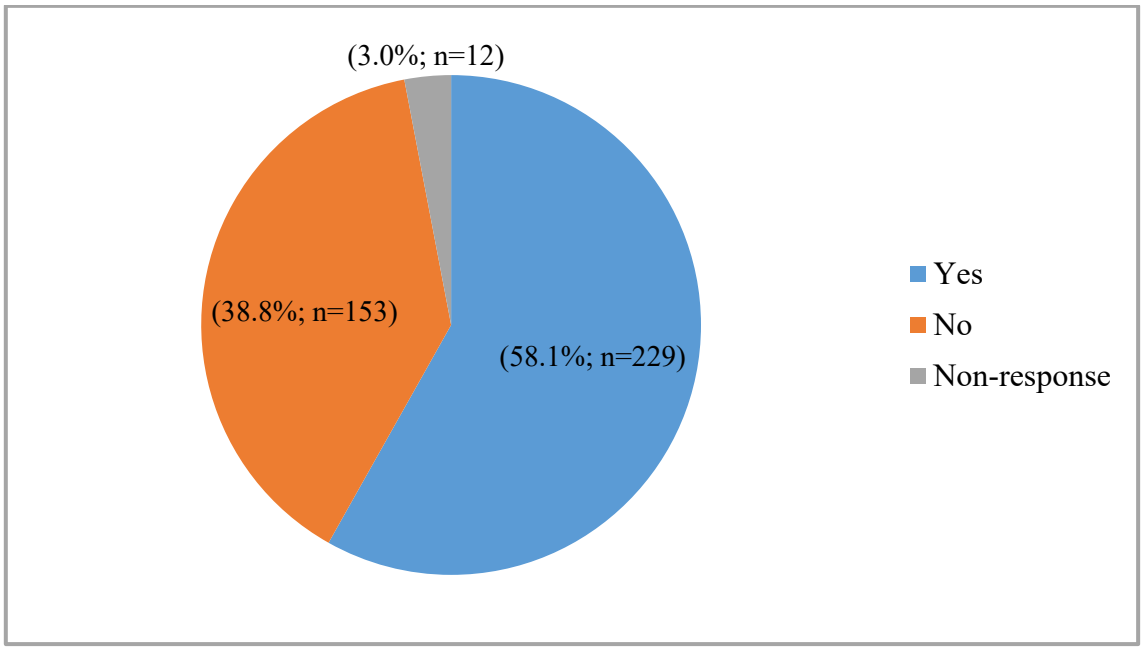

Figure 4.3: Awareness of the sugar-sweetened beverage tax amongst consumers (n=394)

A binomial test found that a significant number (58.1%; n=229) were aware of the SSB tax ($p<0.0005$), while 38.8% (n=153) were not aware.

Figure 4.4 indicates when the consumers thought that the SSB tax had been implemented.

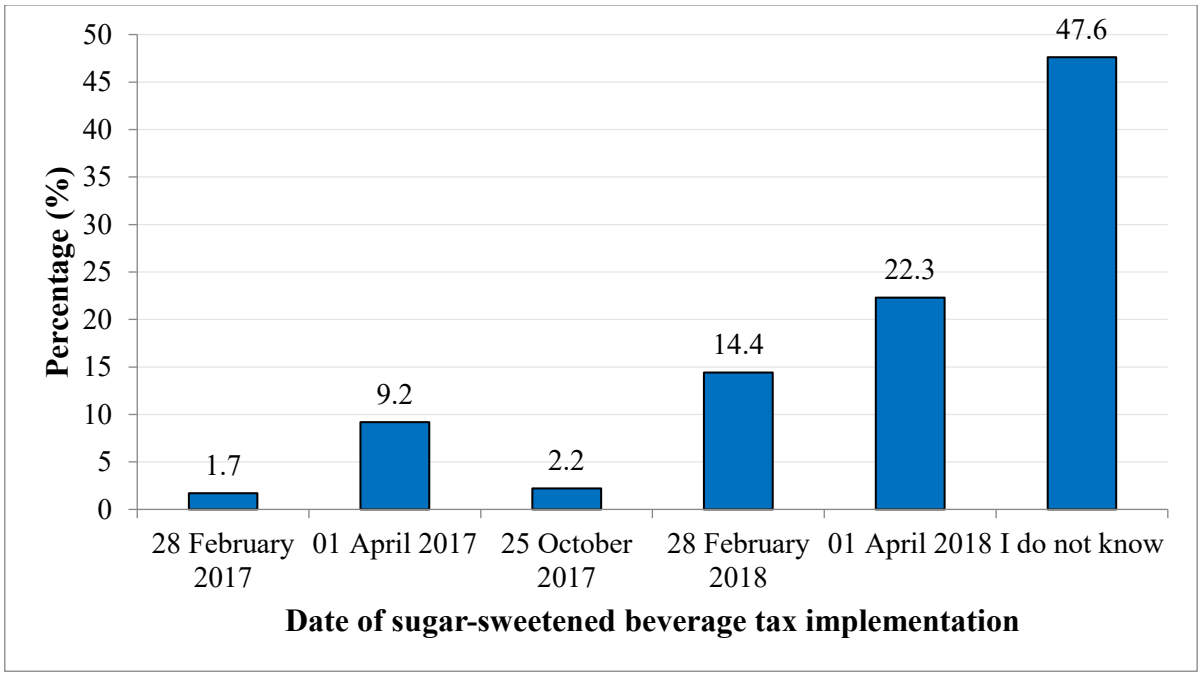

Figure 4.4: Participant responses on the implementation date of the sugar-sweetened beverage tax (n=229)

As shown by a chi-square goodness-of-fit test, a significant number of respondents either reported that they did not know when the SSB tax was implemented (47.6%; n=109) or correctly reported that the SSB tax was implemented on the 1st of April 2018 (22.3%; n=51) ($p<0.0005$).

4.3 Attitudes of consumers towards the sugar-sweetened beverage tax

Figure 4.5 indicates whether the consumers were in favour of the South African SSB tax or not.

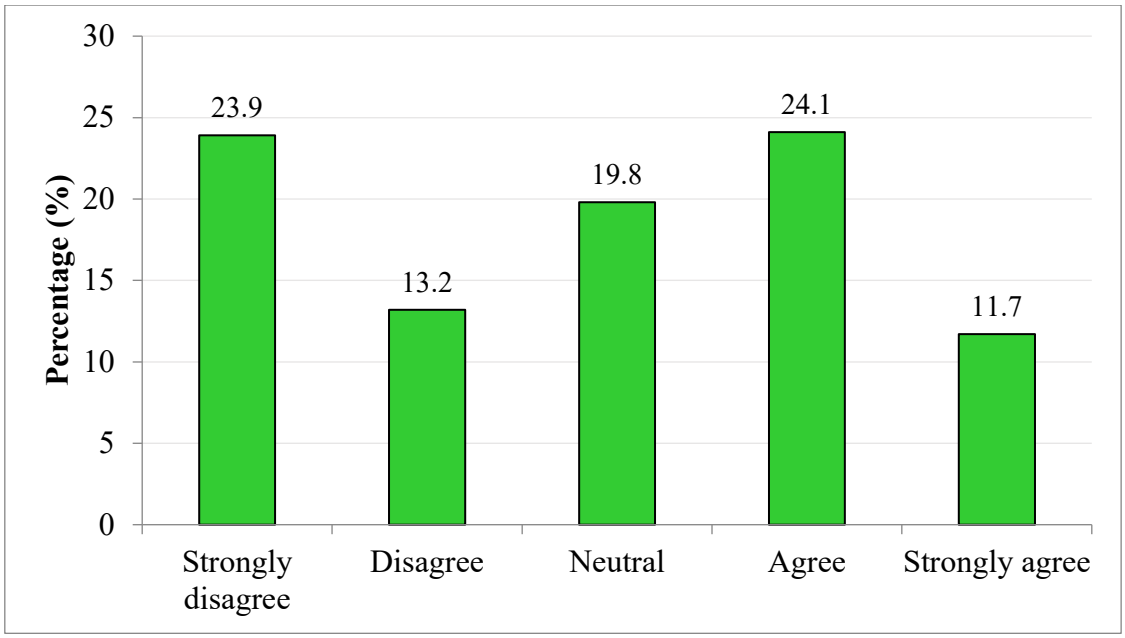

Figure 4.5: Attitudes towards the sugar-sweetened beverage tax (n=394)

For this result, a binomial test, chi-square goodness-of-fit test and one-sample statistics test were applied. Results showed that just over 37% (n=146) of the consumers disagreed to some extent with the SSB tax, while 35.8% (n=141) agreed to some extent with the tax and 19.8% (n=78) were neutral. A chi-square goodness-of-fit test showed that significant numbers either strongly disagreed (23.9%: n=94) or agreed (24.1%; n=95), ($p<0.0005$). So, there was a definite split as to whether consumers were in favour of the SSB tax or not.

Table 4.7 outlines the consumers' reason for their agreement or disagreement with the SSB tax. The comments given by the consumers were summarised into common themes (Table 4.7).

Table 4.7: Reasons for agreement or disagreement with the sugar-sweetened beverage tax (n=229)

Agreement with SSB tax		
Common reasons	**n (%)**	**Verbatim comments**
The money generated will help the health care system/improve individual health	88 (38.4)	'sugar is bad for health and the tax will reduce its consumption'; 'sugar causes illnesses'; 'the SSB tax will reduce obesity'; 'we are becoming an overweight society'; 'the tax will go towards funding health purposes'; 'it will get us used to drinking water'; 'the tax will force companies to make healthier products'; 'it will decrease the burden on health care'
I don't consume sugar/ SSBs	6 (2.6)	'I don't buy SSBs often, only when I feel like it'; I don't consume much sugar'; 'I don't have sugar'; 'I don't spend a lot on these drinks'
It will boost the economy	12 (5.2)	'it will increase our economy'; 'the amount of sugar sold can raise mass amounts of revenue'; 'generates money'; 'boosts productivity'
Disagreement with SSB tax		
Common reasons	**n (%)**	**Verbatim comments**
The cost of living is too high	50 (21.8)	'it is an extra expense to the community'; 'I earn too less/ cannot afford it'; 'it affects the poor the most'; 'we already pay enough taxes'.
The money will go to the government and will not benefit us	29 (12.7)	'government likes to make money off people'; government will just steal the money generated and not use it for a good cause'; 'it's only for government';
The government should direct their attention elsewhere	7 (3.1)	'there are other products like cigarettes and alcohol that should be taxed'; 'why don't they charge tax on alcohol and fast food, they must redirect their attention'
I do not have enough information regarding the SSB tax	9 (3.9)	'I don't know anything about the SSB tax'; 'I don't know enough about it'; 'I know nothing about these things'; 'I am neither against not in favour'
I like SSBs/people will not stop buying SSBs	28 (12.2)	'it's a personal choice'; 'people will still buy the drinks even if the price increases or not'; 'the SSB tax won't change what people are used to'; 'you have to pay for something to enjoy'

Thirty eight percent of the consumers (n=88) felt that the SSB tax would help the health care system and/or individual health (in agreement with the SSB tax). The second most common theme (21.8%; n=50), in disagreement with the SSB tax, was that the cost of living was too high. The least common theme (2.6%; n=6) was that the consumer did not consume sugar and/or SSBs.

Figure 4.6 below indicates what the consumers felt that the money generated from the sugar-sweetened beverage tax, should be used for.

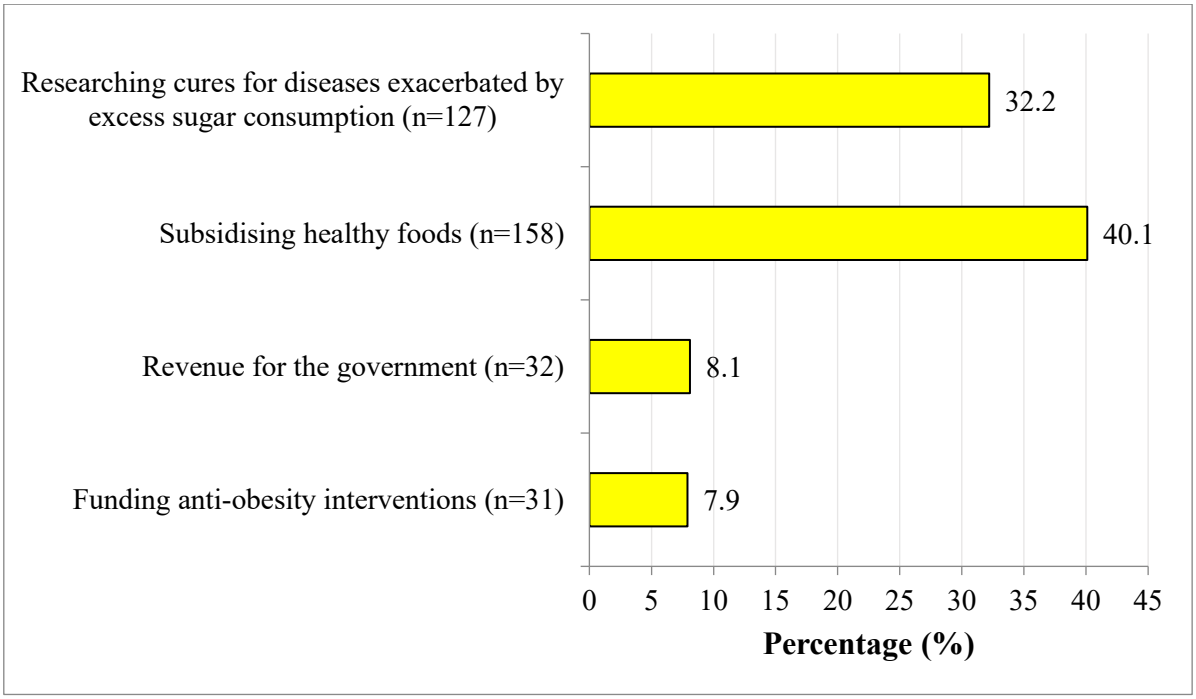

Figure 4.6: Indication of what the money generated from the sugar-sweetened beverage tax should be used for (n=394)

According to a chi-square goodness-of-fit test, a significant number (n=158; 40.1%) preferred that the money be used for 'subsidising healthy foods' and for 'researching cures for diseases exacerbated by excess sugar consumption' (32.2%; n=127) ($p<0.0005$). A significantly small number of the consumers indicated that the money should be used for funding anti-obesity interventions (7.9%; n=31) or as revenue for the government (8.1%; n=32).

The level of agreement or disagreement to statements regarding the South African sugar-sweetened beverage tax is shown below (Table 4.8).

Table 4.8: Consumers' agreement or disagreement to statements related to the sugar-sweetened beverage tax (n=394)

Statements	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
	n (%)				
The South African sugar tax will help reduce obesity in South Africa	68 (17.3)	63 (16.0)	63 (16.0)	105 (26.6)	61 (15.5)
The South African sugar tax will help to reduce the consumption of SSBs amongst consumers	54 (13.7)	62 (15.7)	67 (17.0)	123 (31.2)	44 (11.2)
The South African sugar tax is a money-generating scheme by the government	21 (5.3)	37 (9.4)	86 (21.8)	106 (26.9)	91 (23.1)
The South African sugar tax will negatively affect the economy due to job losses	29 (7.4)	51 (12.9)	97 (24.6)	99 (25.1)	63 (16.0)
The government should be allowed to influence the beverage purchasing decisions of consumers	104 (26.4)	61 (15.5)	63 (16.0)	78 (19.8)	34 (8.6)

A one sample t-test and chi-square goodness-of-fit test was applied to test for significant agreement or disagreement with each of the above mentioned statements. Over 26% (n=105) agreed that the SSB tax would help to reduce obesity in South Africa. In addition, 31.2% (n=123) agreed that the SSB tax would help to reduce the consumption of SSBs. Moreover, 26.9% (n=106) agreed that the SSB tax was a money generating scheme by the government. Almost equal numbers were neutral (24.6%; n=97) or in agreement (25.1%; n=99), that the SSB tax would negatively affect the economy due to job losses. Finally, 26.4% (n=104) strongly disagreed that the government should be allowed to influence the beverage purchasing decisions of consumers.

A one sample t-test was applied to test for significant agreement or disagreement with each of the statements in Table 4.8. There was a statistically significant agreement with each of the following statements: 'the sugar tax is a money-generating scheme by the government' and 'the South African sugar tax will negatively affect the economy due to job losses' ($p<0.0005$). There was a statistically significant disagreement with the following statement: 'the government should be allowed to influence your beverage purchasing decisions' ($p<0.0005$).

While significantly more than expected agreed that the sugar tax would help reduce obesity in South Africa, on average, there was neither significant agreement nor significant disagreement that the South African sugar tax would help to reduce obesity in South Africa. Similarly, a significant number of consumers agreed that the tax would reduce the consumption of SSBs. However, there was neither significant agreement nor disagreement with this statement.

4.4 Response of consumers towards the sugar-sweetened beverage tax, in terms of purchasing behaviour

An indication of the responses, in terms of purchasing behaviour, following the implementation of the sugar-sweetened beverage tax is presented below (Figure 4.7)

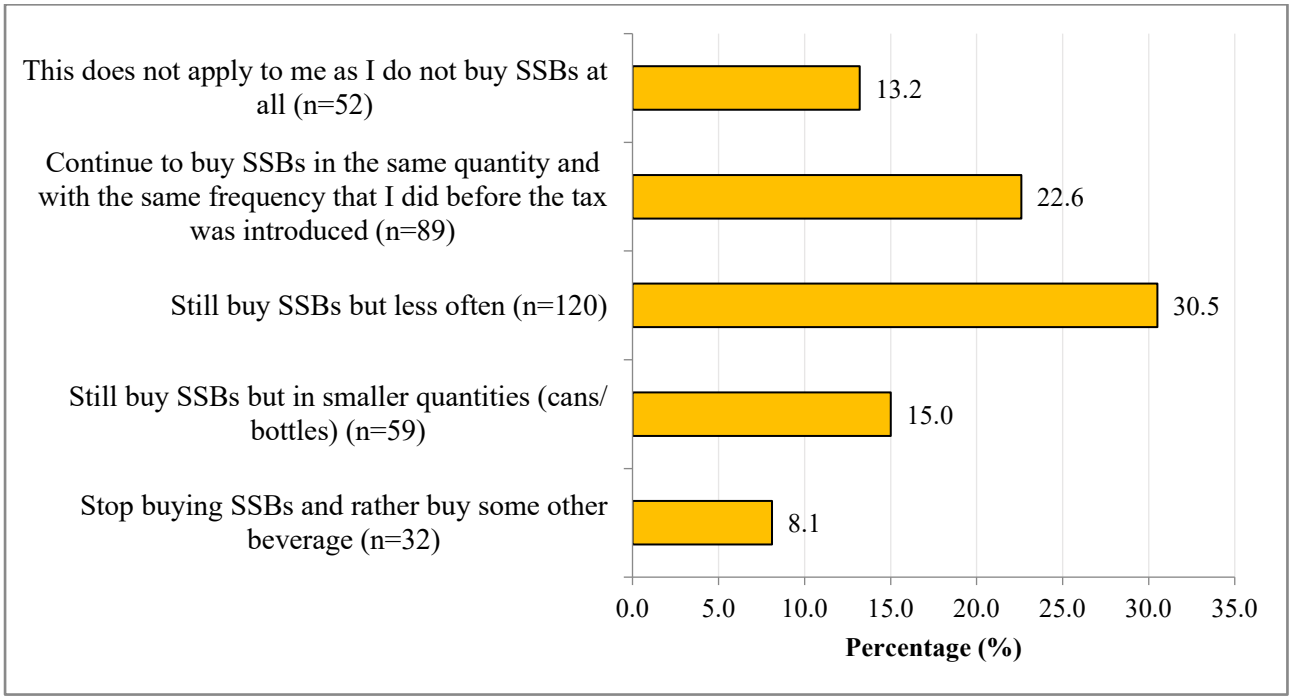

Figure 4.7: Responses to the sugar-sweetened beverage tax in terms of purchasing behaviour (n=394)

Just over 30% (n=120) of the consumers indicated that they would 'still buy SSBs but less often'. Only 8.1% (n=32) responded that they would 'stop buying SSBs and rather buy some other beverage'. A chi-square goodness-of-fit test was applied to the results above and it was found that significantly more consumers would 'still buy SSBs but less often' and 'continue to buy SSBs in the same quantity and with the same frequency that they did, before the tax was introduced'. In addition significantly fewer than expected would 'still buy SSBs but in smaller quantities (cans/bottles)' and 'stop buying SSBs and rather buy some other beverage' ($p<0.0005$).

The alternatives which would be considered by the consumers if sugar-sweetened beverages were no longer affordable to them, are shown in Figure 4.8.

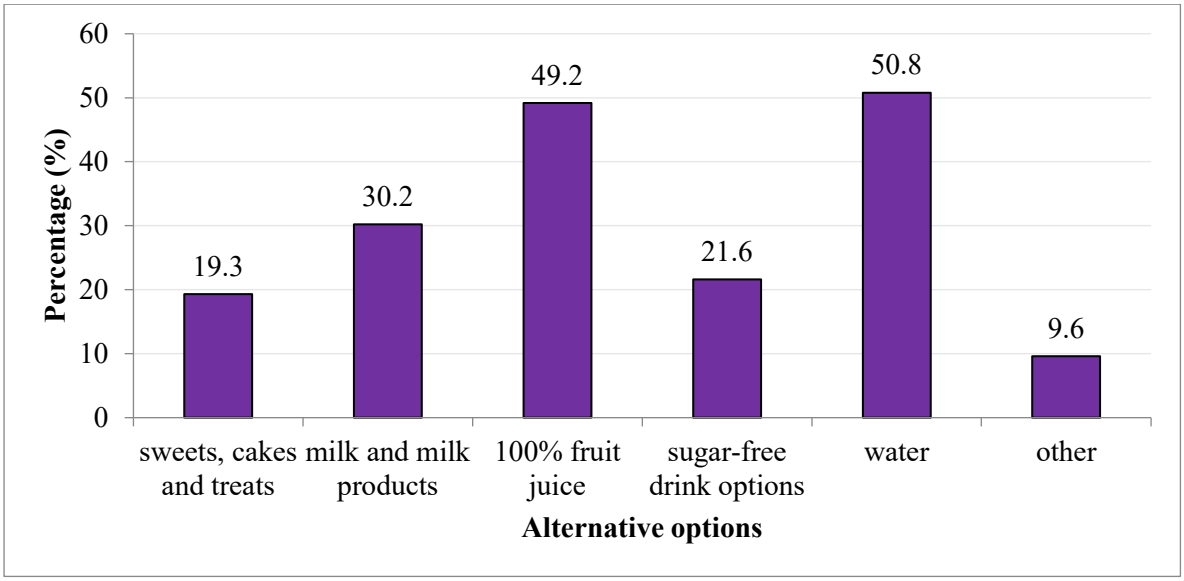

Figure 4.8: Alternative beverage options if sugar-sweetened beverages were no longer affordable (n=394)

Just over 50% (n=200) indicated that they would choose water as an alternative to SSBs, followed by 100% fruit juice (49.2%; n=194). Approximately a third (n=119) chose milk and milk products as an alternative, while 21.6% (n=85) indicated that they would opt for sugar-free drink options. Only 19.3% (n=76) of the consumers indicated that they would consider sweets, cakes and treats as an alternative.

A binomial test showed that the following alternative buys: sweets, cakes and treats (n=294; 19.3%), milk and milk products (30.2%; n=251), sugar-free drink options (21.6%; n=284) and other (9.6%; n=328), would not be considered by a significant proportion ($p<0.0005$).

Table 4.9 includes the common themes which the consumers suggested as approaches the government should consider to reduce obesity rates in the country

Table 4.9: Comments from consumers regarding the other approaches the government should consider to reduce the rates of obesity in South Africa (n=249)

Approaches to reduce obesity rates	n (%)	Verbatim comments
Increase physical activity and/or increase the affordability of physical activity	56 (22.5)	'free gyms/ fitness centres'; access to subsidised gyms'; 'better recreational facilities'; 'promote sport in schools'; 'have more play grounds for children and cleaner parks'
Increase nutrition education and awareness of diseases, health and SSBs	68 (27.3)	'have more health awareness campaigns'; 'implement an education programme in the schools'; 'health education seminars'; 'knowledge on obesity'; 'fund research'
Make healthy foods more affordable	27 (10.8)	'the cost of healthy foods must be dropped'; 'no tax on healthy foods'
Taxes and regulations on unhealthy foods	44 (17.7)	'close down SSB manufacturers'; 'ban billboards with junk food on public sites'; 'ban shops which sell products containing high sugar levels'; 'more drastic sugar tax'; 'SSB manufacturers to decrease sugar content in the SSBs'; 'stop selling unhealthy foods'; 'stricter laws for street vendors'
Concentrate on corruption and not the SSB tax	6 (2.4)	'concentrate on crime levels'; 'concentrate on the corruption'; 'government should redirect their attention on reducing crime and fuel prices, or help the homeless with housing'; 'find ways to reduce deaths in the country'
Reduce the prices of SSBs	8 (3.2)	'don't raise the prices of SSBs'; 'do not pay taxes'
Increase employment for dietitians and health care workers	7 (2.8)	'employ more dietitians'; 'employ more health care workers'; 'get qualified people involved'
Implement healthy foods and drinks	24 (9.6)	'Jojo tanks and vegetable gardens in schools'; 'healthy, tasty options'; 'cut the price on water'; 'introduce a product which can replace SSBs, that is just as good but healthy'; 'supply healthy foods and beverages to the country' 'promote vegan life'
The government must do nothing/It is up to the individual to make choices regarding their health	6 (2.4)	'no comment', nothing!'; 'none-it's up to each person to decide how he/she wants to live'; 'people must know what to do'
Decrease the cost of health care/ Introduce free health care	3 (1.2)	'free health care'; 'free weight-loss programmes'; 'more clinics must be opened'

Some other approaches to reduce obesity rates as mentioned by the consumers included: an increase in nutrition education and awareness of diseases, health and SSBs (27.3%; n=68); increase in physical activity and/or increase the affordability of physical activity (22.5%; n=56) and taxes and regulations on unhealthy foods (17.7%; n=44).

4.5 Other significant findings

- There was a significant relationship between awareness of the beverage tax and age ($p<0.001$). A significant number of the consumers in the 31-50 year old age group were aware of the SSB tax; while a significant number of the consumers in the 18-30 year old age group were not aware of the SSB tax.
- There was a significant relationship between awareness of the beverage tax and race ($p<0.0005$). In particular, a significant number of the Whites and Indians were aware of the SSB tax; while a significant number of the African were not aware of the SSB tax.
- There was a significant relationship between awareness of the beverage tax and total household income ($p=0.045$). In particular, a significant number of those who earned more than R40 000 per month were aware of the SSB tax; while a significant number of those who did not know their total household income were not aware of the SSB tax.
- A significant relationship existed between awareness and buying milk and milk products as an alternative ($p=0.017$). A significant number of those who were not aware of the SSB tax indicated that they would buy milk and milk products, if they could not afford SSBs.

4.6 Summary of findings

In this study, most consumers were between the ages of 18-30 years old (45.7%; n=180). Indian (42.6%; n=168) and African (41.4%; n=163) consumers were the most common race groups that participated and were nearly equal in number. Just over 43% (n=170) of the consumers had a matric certificate, whereas 0.8% (n=3) had no formal education. Most consumers (70.3%; n=277) reported that they did not have any medical diagnoses. However, the most common medical diagnosis was high blood pressure (15.2%; n=60). Approximately three-thirds of the consumers came from a household of two-five individuals, including themselves (74.7%; n=294). The most common monthly income bracket was R0-R10 000 (36.8%; n=145) however, as the salary brackets increased, so did the number of respondents. A significant number (62.2%; n=245) indicated that they were responsible for purchasing the monthly groceries. Those who did not do their own monthly shopping, indicated that it was done by parents (59.5%; n= 88) or spouse/partners (18.9%; n= 28). Results showed that 4.9% (n=12) spent R500 or less on food per month, while 25.7% (n=63) spent R1001-R1500. In addition, most consumers spent R0-R100 (42.9%; n=105) on SSBs per month. A significant number

(92.9%; n=366) reported that they consumed SSBs. The most frequently consumed SSBs (one-two times a week) were soft drinks (49.2%; n=180) and sports/energy drinks (30.6%; n=112).

Reasons for purchasing SSBs included: drinking SSBs when going out instead of alcohol; enjoying the taste of SSBs; quenching thirst in hot weather; friends/family like to drink SSBs and SSBs 'complete a meal'. Some of the settings in which SSBs were consumed included: At home, at work or varsity, family 'get together'/parties/ braais/weddings, at restaurants/take-aways, during/after sports/gym, a day out (e.g. park/ beach). Factors that were important when purchasing SSBs included: the price, the brand, the sugar content and the taste. Just over 58% (n=229) were aware of the sugar-sweetened beverage tax and 47.6% (n=109) did not know when the SSB tax was implemented. However, 22.3% (n=51) correctly reported that the SSB tax was implemented on the 1st of April 2018. Most consumers (38%; n=88) felt that the SSB tax would help the health care system and/or individual health. A significant number of consumers preferred that the money generated from the SSB tax be used for 'subsidising healthy foods' and for 'researching cures for diseases exacerbated by excess sugar consumption'. A significant number of consumers felt that 'the sugar tax is a money-generating scheme by the government' and 'the South African sugar tax will negatively affect the economy due to job losses'. However, some consumers also felt that the South African sugar tax would help to reduce obesity in South Africa and reduce the consumption of SSBs amongst consumers. Over a third of consumers stated that they would 'still buy SSBs but less often' (30.5%; n=120). Nearly half the consumers indicated that water (n=200; 50.8%) and 100% fruit juice (49.2%; n=194), would be their alternative options if SSBs were no longer affordable to them. Finally, nearly a third of consumers indicated they would like to see an increase in nutrition education and awareness of diseases, health and SSBs (27.3%; n=68).

CHAPTER 5: DISCUSSION

This study aimed to assess the awareness, attitudes and response to the sugar-sweetened beverage tax among consumers in Pietermaritzburg, KwaZulu-Natal. This chapter discusses the results presented in Chapter 4.

5.1 Demographic characteristics of consumers

The majority of consumers (45.7%; n=180) were between the ages of 18 and 30 years old. As the age groups increased, the number of consumers decreased. In other words, 36.5% (n=144) were between the ages of 31-50 years old, 16.0% were between the ages of 51-70 years old and 1.3% (n=5) were over 70 years old. Those who are 60 years old or younger are the most economically active part of the population (Manyema *et al* 2015). Hence, these individuals were more likely to be shopping at a shopping centre. Truro Plaza and Derby Place were predominantly made up of Indian shoppers because these shopping centres are located in Bombay Heights and Northdale, respectively. According to the Group Areas Act from the apartheid era (Department of Economic and Social Affairs 2012), Indians predominantly occupied Bombay Heights and Northdale in Pietermaritzburg. Based on observation, the consumers at Scottsville Mall, Laager Centre and Southgate Mall were predominately African and Indian shoppers. The consumers at the remaining shopping centres, Victoria Centre and Cascades, were of mixed race. It is for this reason that the sample consisted mainly of African (41.4%; n=163) and Indian (42.6%; n=168) consumers, while only 9.9% (n=39) Whites and 4.6% (n=18) Coloureds participated. This is in line with the Census 2011 data, which showed the racial profile of KwaZulu-Natal to be 86.8% African, 7.4% Indian, 4.2% white and 1.4% coloured (Statistics South Africa 2012).

More than half of the consumers had a matric certificate or tertiary education (79.4%; n=313), compared to 0.8% (n=3) with no formal education or 19.0% (n=75) with grade 11 or less. The level of education is generally higher among urban residents when compared to rural residents (Department of Basic Education 2016). This is due to a lack of resources and funding allocated to the rural areas of South Africa (Department of Basic Education 2016). Those with a tertiary education generally have a higher income and are therefore at greater risk of obesity, due to increased consumption of convenience foods and take-aways (Cois & Day 2015; Steyn & Mchiza 2014). Although the researcher did not weigh consumers and calculate BMI for this study, only 2.3% (n=9) self-reported that they were medically diagnosed as being overweight or obese. However, this may have been an underestimation of the true prevalence of

overweight or obesity among the consumers. The small percentage who self-reported that they were overweight or obese could be due to a lack of accurate diagnosis or denial of weight status, due to self-esteem challenges (Agrawal *et al* 2015; Harriger & Thompson 2012). There is a perception among the South African Zulu culture that an obese woman is more desirable to a male, than a slim woman (Okop *et al* 2015; Devanathan *et al* 2013; Talbot & Pienaar 2012). This is because obesity symbolises wealth, prosperity and affluence, while on the other hand, losing weight or being slim is associated with HIV (Okop *et al* 2015; Devanathan *et al* 2013; Talbot & Pienaar 2012). In addition, the South African Demographic and Health Survey (SADHS) (2016) reported that 68% of women and 31% of men in South Africa are overweight or obese, which is not in line with the current study findings.

In this study most consumers self-reported that they did not have any medically-diagnosed conditions (70.3%; n=277). According to the WHO (2014), NCDs will be the largest cause of death in South Africa by 2030. Increasing age makes a significant contribution to the development of NCDs (Nojilana *et al* 2016) and this study comprised of mainly younger consumers, as discussed previously. Another reason for the high number of consumers without medically diagnosed conditions could be due to a lack of honesty when answering the questionnaire. With this being said, high blood pressure was the most common medical diagnosis (15.2%; n=60). However, this result is not in line with the 25.2% prevalence of hypertension noted for KwaZulu-Natal in 2015 (Cois 2016). The second most common medical diagnosis was diabetes (8.1%; n=32), which is higher compared to the UMgungundlovu statistics for the prevalence of diabetes mellitus of 0.4% (Cois 2016). The higher prevalence of diabetes mellitus in this study could be due to a large portion of the sample being Indian. According to Nojilana *et al* (2016), the South African Indian population is more prone to diabetes and hypertension compared to other race groups, due to their genetics and dietary practices. The SANHANES-1 indicated that the rate of self-reported family history of high blood pressure (46.8%), heart disease (28.8%) and high blood glucose (49.0%) was highest among Indians (Shisana *et al* 2013).

Generally, most families are made up of between two to five members (Department of Economic and Social Affairs 2012). This was the case in this study, where approximately 75% of consumers came from a family of this size (74.6%; n=294). Only 6.6% (n=26) lived alone and 17.8% (n=70) lived with a family of six or more, including themselves. The most common total monthly household income amongst the consumers was R0-R10 000 (36.8%; n=145). As the salary brackets increased, the number of respondents decreased. According to the

Department of Economic and Social Affairs (2012), South Africa is well known for its income inequalities. This could explain the large differences in salary ranges noted in this study. A further 22.3% (n=88) of consumers did not know what their total monthly household income was, as they were not involved in the household finances. As stated earlier, most consumers could be classified as being an economically active part of the population (Manyema *et al* 2015) and are therefore more likely to be shopping for groceries. In this study, 62.2% (n=245) were responsible for the grocery purchases for their homes, while 37.6% (n=148) were not. It was either the parent(s) (59.5%; n=88), spouse or partner (18.9%; n=28), grandparent(s) (7.4%; n=11), sibling(s) (5.4%; n=8), 'other' (3.4%; n=5), friend (2.7%; n=4) or aunt/uncle(s) (0.7%; n=1), who purchased the groceries. In this study, approximately a quarter of the consumers spent R1 001-R1 500 on food per month (25.7% n=63), while nearly a quarter (22.9%; n=56) spent over R2 500. A further 4.9% (n=12) stated that they spent less than R500 monthly. In South Africa, the affluent spend only 10% of their income on food, compared to the poor who spend 30%. However, the affluent consume and purchase more food (Department of Economic and Social Affairs 2012). This could be attributed to the unequal income distributions in South Africa (Department of Economic and Social Affairs 2012). With regards to SSB purchases, this study indicated that the majority of consumers spent R0-R100 (42.9%; n=105) on SSBs monthly, while 13.5% (n=33) spent more than R300. A third of the consumers spent R101-R200 (30.2%; n=74) and 12.2% spent R201-R300 (n=30). According to the Department of Economic and Social Affairs (2012), the affluent spend 0.7% of their income per year on SSBs, while the poor spend 1.3%.

This study showed that 92.9% (n=366) of the sample consumed SSBs. Soft drinks were consumed one-two times a week by almost half the consumers (49.2%; n=180), while energy drinks were consumed one-two times a week by 30.6% of consumers (n=112). According to the WHO, the intake of free sugars (including added sugars) should be reduced to less than 10% of total energy intake (ADSA 2017). In addition, the WHO has stated that 330 ml of a carbonated SSB has approximately 35 g of sugar, almost reaching the maximum daily recommended amount of 50 g. In addition, one of the South African FBDGs states that one should 'use sugar and foods and drinks high in sugar sparingly' (ADSA 2017). Regardless of these guidelines, the frequency with which SSBs were consumed was shown to be high.

Squashes (29.0%; n=106), iced tea (45.6%; n=167) and vitamin water (42.1% n=154) were not consumed as frequently as soft drinks and energy drinks. Stacey *et al* (2017b) outlined that across all beverage categories, energy drinks achieved the highest sales volume in South Africa.

Furthermore, South Africa is classified amongst the top 10 consumers of SSBs worldwide (Manyema *et al* 2015). The consumption trends shown in this study are also in line with a statement made by Seedat & Singh (2017) that 'South Africans consume about 184 ml of SSBs per day and this figure is expected to increase over the next few years'. A consequence of the high rate of SSB consumption is overweight and obesity. According to Benade & Essop (2017), the 15-24 year age group consumes the largest amount of SSBs. In this study, 45.7% (n=180) of consumers were 18-30 years old and a significant 92.9% (n=366) of the sample consumed SSBs.

Results showed that consumers purchased SSBs for the following reasons: SSBs are a drink option when going out and consumed instead of alcohol (e.g. at restaurants/family events); the taste is enjoyable; SSBs are used for quenching thirst; friends/family like to drink SSBs or 'it completes a meal'. According to Woodward-Lopez *et al* (2010), SSBs are consumed in large amounts because of their inability to create satiety. Due to this, a person may over eat to compensate for the decreased satiety (Woodward-Lopez *et al* 2010). In addition, SSBs are very palatable and can cause a rapid spike in blood glucose, creating a feeling of euphoria (Seedat & Singh 2017). According to Stacey *et al* (2017b), SSBs are found nearly anywhere, especially in social settings. It is for this reason that consumers agreed that they consumed SSBs in all of the given settings: at home, at work or varsity, family 'get together'/parties/braais/weddings, at restaurants/take-aways, during/after sports/gym and a day out (e.g. park/beach). According to Langley *et al* (2017) and the Canadian Heart and Stroke Foundation (2014), SSBs should be banned from work, schools and parks as they are often purchased in these settings. In 2012, New York banned SSBs with a volume of 500 ml or more in cinemas, sports events and restaurants (Konwicki 2016).

The following factors were of importance to the consumers when purchasing SSBs: the price; the brand; the sugar content and the taste. According to Stacey *et al* (2017b) and Hu (2013), the following factors greatly influence the consumption of SSBs: affordability, availability, taste, quality and variety of brand options. According to ADSA (2017), the price of SSBs is the largest determinant of food purchasing, followed by taste. Although the design and packaging of the SSBs, pressure from other people and advertisements for SSBs were not significantly important to the consumers, Stacey *et al* (2017b) and Hu (2013) indicated that the marketing strategy was a key factor influencing the consumption of SSBs. The results showed that SSBs were important/very important to 34.5% (n=126) of consumers, while almost the same number (34.2%; n=125) indicated that SSBs were not important/not important at all.

Although the consumers frequently enjoyed SSBs in a variety of settings, they were divided on the level of importance given to SSBs.

5.2 Awareness of the sugar-sweetened beverage tax among consumers

A significant number (58.1%; n=229) of consumers indicated that they were aware of the South African SSB tax, whilst the remaining 38.8% (n=153) were not aware. In addition, almost half of the consumers did not know that the South African SSB tax was implemented on the 1st April 2018 (National Treasury 2016). More consumers in the 31-50 year old age group were aware of the SSB tax, while fewer in the 18-30 year old age group were aware. Older people are more likely to be employed compared to the younger generation, who may be students or unemployed. Therefore, older individuals are more likely to be aware of what their income is spent on. Older people are also more likely to read newspapers and watch the news compared to younger people. Moreover, a significant number of those who earned more than R40 000 per month were aware of the SSB tax, while those who did not know what their total household monthly income was, were not. Those earning R40 000 or more may have a higher education level and could therefore be more aware of what is happening in South Africa. Because the SSB tax was only recently implemented in South Africa, there are limited similar local studies to compare these findings to.

5.3 Attitudes of consumers towards the sugar-sweetened beverage tax

The attitudes of the consumers towards the SSB tax varied widely. This could be because the SSB tax is new to South African consumers. Seventy-eight consumers (19.8%) were neutral towards the SSB tax because some were not aware of it (3.9%; n=9). However, if these 78 people were removed from the equation, there would be nearly equal amounts of consumers who were in agreement (35.8%; n=141) and disagreement (37.1%; n=130) with the tax. Overall, the consumers leaned towards 'disagreement' with the SSB tax. International studies showed that 22% of Americans, less than 50% of Mexicans and 57.7% of French citizens were in agreement with the SSB tax, implemented in those specific countries (Myers *et al* 2017; Julia *et al* 2015; Donaldson *et al* 2014). In addition, increased support of the SSB tax came from those who were older, non-obese and with higher levels of education (Myers *et al* 2017; Julia *et al* 2015). This could not be compared to the current study because most consumers were young, and the prevalence of obesity was not directly determined. However, most consumers had higher levels of education, including a matric certificate or tertiary

qualification. Donaldson *et al* (2014) also outlined that the less supportive Americans were those who enjoyed SSBs, however in this study, no significant importance was given to SSBs.

The WHO (2016) encourages the implementation of a SSB tax in order to reduce SSB consumption and promote healthier food choices. Some consumers (38.4%; n=88) were in agreement with the SSB tax, as they felt that the money generated would help the health care system and/or improve individual health. However, 21.8% (n=50) who disagreed with the SSB tax, stated that the cost of living was already too high. According to Minton (2016), Jeffery (2016) and Coca-Cola South Africa (2016), the SSB tax is a disadvantage to the poor who cannot afford the tax and is unlikely to improve public health. Although many see a health benefit because of the SSB tax, some see it as unaffordable. Other reasons why consumers were in agreement with the SSB tax was that they did not consume sugar/SSBs (2.6%; n=6) and that the SSB tax could boost the economy (5.2%; n=12).

Some consumers disagreed with the SSB tax as they felt that the money generated would go to the government and not benefit the consumers (12.7%; n=29). Some consumers (3.0%; n=7) felt that the government should rather direct their attention to other more important issues. Myers *et al* (2017) points out that SSB taxes are more likely to receive support if the public are aware that the money generated would be used to promote health. Some also stated, in disagreement with the SSB tax, that they liked SSBs and would not stop buying them (12.2%; n=28). Several studies have outlined the importance that consumers give to SSBs, especially due to marketing, popularity and urbanisation (Myers *et al* 2017; Coca Cola South Africa 2016; Mahan *et al* 2016; Cois & Day 2015; p402 Steyn & Mchiza 2014).

It has been suggested that the money generated from the South African SSB tax should be used to subsidise the cost of fruit and vegetables (ADSA 2017). Some consumers (40.1%; n=158) agreed with this, while a further 32.2% (n=127) indicated that it should be used to research cures for diseases exacerbated by excessive sugar consumption. According to the Canadian Heart and Stroke Foundation (2014), government should focus on research areas which involve measuring the sugar and energy intake of a country and assessing the free sugar content of food items. Moreover, ADSA (2017) has suggested that the money generated from the SSB tax should be used to support research within the National Department of Health Strategy for the Prevention and Control of Obesity in South Africa.

Nearly equal amounts of consumers agreed that the income generated from the SSB tax should be used as revenue for the government (8.1%; n=32) or to fund anti-obesity interventions

(7.9%; n=31). According to Bedi (2018), Myers *et al* (2017) and Manyema *et al* (2015), many people would rather see the money generated from the SSB tax going towards obesity preventative strategies, and not towards government revenue. However, the issue of the revenue generated from the tax going towards government has been raised by the National Treasury (2016), Jeffery (2016), Duckett & Swerissen (2016) and Minton (2016). This is because it would be a simple and convenient method to gain revenue. In addition, it could correct the budget deficit, recoup the costs of obesity, and offset public costs of harmful products (such as the cost of obesity to health care) and fund government projects (Duckett & Swerissen 2016; Jeffery 2016; Minton 2016). Using the revenue for anti-obesity interventions has been suggested by ADSA (2017), the National Treasury (2016), Duckett & Swerissen (2016) and Dobbs *et al* (2014). Countries which have implemented this include the UK, which uses the SSB tax money to promote healthy eating (Bedi 2018; Konwicki 2016), while Philadelphia in the USA uses it for promoting physical activity (Dilk & Savaiano 2017; Minton 2016).

The aim of the SSB tax is to reduce the consumption of SSBs and the rates of obesity (ADSA 2017; National Treasury 2016), however, the outcomes are debatable (ADSA 2017; Jeffery 2016; National Treasury 2016; Manyema *et al* 2014). A significant 42.1% (n=166) and 42.4% (n=167) of consumers agreed/strongly agreed that the SSB tax should be used to reduce obesity rates and the consumption of SSBs, respectively. Thus far, the UK and Ireland have both reduced obesity rates by 1.3%, after the introduction of the SSB tax (Manyema *et al* 2015; Mhurchu *et al* 2014; Briggs *et al* 2013). Other cities and countries which have already seen a decline in the rates of SSB consumption after the implementation of the SSB tax, include California in the USA, Mexico, France and Ireland (Dilk & Savaiano 2017; Guthrie & Esterl 2016; Briggs *et al* 2013).

In addition, 50.0% (n=197) agreed/strongly agreed that the SSB tax is a money-generating scheme by the government. Furthermore 41.1% (n=162) agreed/strongly agreed that the SSB tax would negatively affect the economy due to job losses. Coca-Cola South Africa (2016) and Jeffery (2016) strongly believe that the economy of South Africa will be affected in terms of job losses, whereas ADSA (2017) stated that the impact on the South African economy is unknown. Gumbel (2016) and Manyema *et al* (2015) explain that there is less risk of employment being affected due to the SSB tax in developed countries, when compared to South Africa. This is because South Africa has much higher rates of unemployment. In Mexico, 3 000 jobs were lost in 2014 over a three month period, due to the SSB tax (Guthrie & Esterl

2016). In addition, 5 000 individuals lost their jobs in Denmark, following the implementation of the SSB tax (Seedat & Singh 2017). Due to the significant agreement with all these statements, attitudes towards the SSB tax were divided.

Many people believe that the government should not be allowed to influence consumer choices. However, this is mostly applicable to Americans, who value their freedom (Dana & Nadler 2018; Talbot & Pienaar 2012). It is unknown whether this would be the same for South Africans (Dana & Nadler 2018; Talbot & Pienaar 2012). This study showed that about 42% of consumers felt that the government should be not allowed to influence the beverage purchasing decisions of consumers.

5.4 Response of consumers towards the sugar-sweetened beverage tax, in terms of purchasing behaviour

According to Minton (2016), the effect of the SSB tax on consumer behaviour is unpredictable. Results indicated that about one third of the consumers would still buy SSBs, but less often, following the introduction of the SSB tax. However, 22.6% (n=89) indicated that they would continue to buy SSBs in the same quantity, and with the same frequency as they did before the SSB tax was introduced. Coca-Cola South Africa (2016) has introduced smaller volumes of SSBs to help people with portion control, however, only 15.0% (n=59) said that they would still buy SSBs, but in smaller volumes. A mere 8.1% (n=32) would stop buying SSBs and buy another beverage instead. This means that about half (53.6%; n=211) of the consumers would make healthier choices regarding SSBs now that the SSB tax has been implemented, after excluding those who do not buy SSBs at all (13.2%; n=52). These findings are in line with a statement from the National Treasury (2016), that a 20% increase in the price of SSBs, which has been implemented, is required to influence consumer purchasing decisions, by reducing the demand for SSBs.

Factors which influence consumer responses to the SSB tax include sensitivity to price, socio-economic status of the population, and consumption rates of the population and substitution options (Quirmbach *et al* 2018; Coca-Cola South Africa 2016; Theron *et al* 2016). When comparing these factors to the current study, the price of SSBs was of significant importance to the consumers, the majority of the sample were of low socio-economic status and the consumption rates of soft drinks and energy drinks was high. A study by Minton (2016), revealed that low income earners in Mexico were least likely to reduce their SSBs purchases after the implementation of the SSB tax. This study did not show similar results because the

majority of the consumers were low income earners and half of them indicated that they would make healthier choices in response to the South African SSB tax. According to Bedi (2018), the SSB tax has mostly led to a significant decrease in SSB purchases, when considering past international studies. For example, Mexico saw a 10% decrease in SSB purchases (Guthrie & Esterl 2016; Blecher 2015). However, the current study indicated that only 8.1% (n=32) would stop buying SSBs and replace them with some other beverage.

It has been suggested that consumers would turn to other high energy/high sugar sources following the introduction of the SSB tax, resulting in no change to obesity rates (Langley *et al* 2017). Cabrera Escobar *et al* (2013) further explained this by outlining that the demand for milk and fruit juice increased when SSBs were taxed in Mexico and the UK. In this study, nearly equal numbers of consumers stated that they would buy water (50.8%; n=200) or 100% fruit juice (49.2%; n=194), as alternative beverages if SSBs were no longer affordable to them. Water is considered the best beverage option because it is healthy and cheap (Hu & Malik 2010), however, fruit juice can also contribute towards weight gain and diabetes, similar to SSBs (Stacey *et al* 2017b). With this being said, fruit juice is still a better option than SSBs as it improves micronutrient intake (Hu 2013; Hu & Malik 2010). Westwater *et al* (2016) and Berkey *et al* (2004) outlined that milk consumption often decreases as SSB intake increases, thereby affecting calcium intake. However, this study found that almost a third of the sample would opt for milk and milk products (30.2%; n=119). A further 21.6% (n=85) chose sugar-free options, which were considered to be better alternatives to SSBs, as they contain little or no energy and/or sugar (Hu & Malik 2010). To further elaborate, sugar-free SSB options have the potential to reduce weight gain, help control total energy intake and prevent further weight gain in those who are already overweight or obese (Cabrera Escobar *et al* 2013; Hu 2013). Cabrera Escobar *et al* (2013) indicated that it is unknown whether the consumption of confectionaries would increase after the introduction of an SSB tax. In this study, sweets, cakes and treats were chosen as alternatives by 19.3% (n=76) of consumers. According to Langley *et al* (2017) and Minton (2016), consumers in Mexico rarely switch from SSBs to sugar-free options or water, as they would generally choose an equally high energy product, which limits the benefits of the SSB tax. However, on the contrary the current study showed that 72.4% (n=285) of consumers would choose water or sugar-free beverages, if SSBs were no longer affordable to them.

Obesity is an issue that needs to be addressed with a range of systematic, sustained government interventions (ADSA 2017; Dilk & Savaiano 2017; Manyema *et al* 2015; Dobbs *et al* 2014).

The South African prevention and control of obesity (Department of Health 2016) focuses on childhood obesity, access to healthy foods and the promotion of physical activity (ADSA 2017). Consumers were asked to indicate which approaches the government should consider, in order to reduce the rates of obesity in South Africa. Their comments, which follow, were similar to the main focus of the South African prevention and control of obesity (Department of Health 2016). In South Africa, there is a lack of nutrition education (Roberto *et al* 2015) and 27.3% (n=68) of consumers indicated that they would like to receive more nutrition education and health awareness. The importance of nutrition education, especially for children due to its long-term impact, has been emphasised by Hashem & Rosborough (2017), Dobbs *et al* (2014) and Steyn & Mchiza (2014). However, Hashem & Rosborough (2017) and Dobbs *et al* (2014) explain that the obesity epidemic is too big to overcome with nutrition education alone. Furthermore, Manning *et al* (2016) outlined that policy development and health promotion and behavioural counselling require more effort and time from the South African government. One approach that the government has now implemented is the SSB tax, which has an awareness-raising element to it (ADSA 2017; Hashem & Rosborough 2017).

A further 22.5% (n=56) of consumers stated that they would like to see an increase in the promotion of physical activity, which should also be made more affordable. This could be due to the fact that there is a lack of recreational space (Manning *et al* 2016), safe parks and sports facilities in South Africa (Mahan *et al* 2016, p402). In addition, gyms are unaffordable to most South Africans (Steyn & Mchiza 2014). Crime is also a significant challenge in South Africa and many South Africans feel unsafe to leave their homes and partake in outdoor activities (Steyn & Mchiza 2014). This may be one of the reasons why 2.4% (n=6) of consumers indicated that the government should focus on crime and corruption and not the SSB tax.

The provision of healthy food and clean, safe water to the public is the responsibility of the government (Cabrera Escobar *et al* 2013; Hu 2013). However, the reality is that unhealthy foods are cheaper than healthy foods (Mahan *et al* 2016, p402; Steyn & Mchiza 2014). It is for these reasons that 10.8% (n=68) of consumers felt that healthy foods should be made more affordable. The implementation of healthy foods and drinks was suggested by 9.6% (n=24) of consumers. In terms of SSBs, Coca-Cola has taken the initiative to decrease the volumes of SSBs sold in order to aid with portion control, as well as work with the government to reduce the sugar content (Coca-Cola South Africa 2016). The South African Minister of Health has indicated that foods high in sugar should be regulated in order to address the obesity epidemic (Tugendhaft & Hofman 2014). In agreement with this, 17.7% (n=44) of consumers felt that

there should be taxes and regulations on unhealthy foods. According to Hashem & Rosborough (2017), taxing is one of the most important approaches, as part of a multidisciplinary strategy, to combat obesity.

A small percentage (2.8%; n=7) stated that they would like to see increased employment of dietitians and health care workers. According to Steyn & Mchiza (2014), there is a lack of human resources to service health care in South Africa. In addition, there are limited dietetic resources to meet the increasing burden of obesity (Manning *et al* 2016). However, a few consumers felt that the government should not intervene, as it is up to the individual to make their own choices regarding their health (2.4%; n=6). This very same statement has also been supported by Mahan *et al* (2016, p402) and Donaldson *et al* (2014). However, Tugendhaft & Hofman (2014) feel that it is the responsibility of the government to ensure that the health and well-being of the public is well protected.

5.5 Summary

The majority of consumers were aware of the South African SSB tax, which increased with income level (more than R40 000 per month) and age (31-50 year olds). The attitudes of the consumers towards the SSB tax varied, because the SSB tax is relatively new to South Africa and no major impact on health or economy has yet been determined. Many believed that it would benefit the country in terms of health, as this is what the South Africa government has indicated as being the main aim of the SSB tax. However, some stated that they cannot afford the tax. It is for this reason that most consumers wanted to see the money generated from the SSB tax being used to subsidise healthy foods. Some consumers stated that the SSB tax would affect the South African economy in terms of job losses, and that is was a money-generating scheme by the government. Due to the high unemployment and poverty rates, the economy is a definite concern for most citizens. Many consumers also did not want the government to influence their beverage purchasing decisions due to the popular 'freedom of choice' concept.

About half of the consumers stated that they would make healthier beverage choices following the implementation of the SSB tax. There has been concern that the public would turn to alternative high energy, high sugar sources, should SSBs become unaffordable. However, this study showed that half of the consumers would opt for water. Other common alternatives included 100% fruit juice and milk and milk products. Although these contribute energy and sugar, they are still healthier beverage options compared to SSBs. Finally, most consumers suggested that they would like the government to reduce obesity rates by increasing nutrition

education and awareness of diseases, health and SSBs. Another common suggestion was the need for an increase in physical activity and its affordability.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

The aim of this study was to investigate awareness, attitudes and response to the SSB tax among consumers in Pietermaritzburg, KwaZulu-Natal. The objectives were as follows: (i) to determine if consumers in Pietermaritzburg, KwaZulu-Natal are aware of the SSB tax (ii) to determine the demographic characteristics of consumers who are aware of the SSB tax in Pietermaritzburg, KwaZulu-Natal (iii) to determine the attitudes of consumers in Pietermaritzburg, KwaZulu-Natal towards the SSB tax and (iv) to determine the response of consumers in Pietermaritzburg, KwaZulu-Natal to the SSB tax, in terms of purchasing behaviour. This chapter presents the study conclusions and recommendations.

6.1 Conclusions

The study sample consisted mainly of African and Indian consumers between the ages of 18 and 30 years old. Most were low income earners with a matric certificate or tertiary education. Almost all consumers reported that they consumed SSBs, however, soft drinks and energy drinks were most frequently consumed. Sugar-sweetened beverages were enjoyed across a range of settings because of their palatability and popularity. Most consumers did the grocery shopping on their own and indicated that price, brand and sugar content were important factors when purchasing SSBs. The majority of the consumers were aware of the South African SSB tax; however, almost half did not know when it was implemented. Indian and White consumers, between the ages of 31 and 50 years old, earning more than R40 000 per month, were the most aware of the South African SSB tax.

Consumers were divided on whether they were in favour of the SSB tax or not. Many felt that the money generated would help the health care system or improve individual health. However, some also stated that the tax would not be affordable for them. Moreover, it was believed that the SSB tax would affect the South African economy negatively and that it was a money-generating scheme by the government. Furthermore, many consumers felt that the government should not influence their beverage purchasing decisions. With this being said, there was neither significant agreement nor disagreement that obesity and SSB consumption rates would decline after the implementation of the SSB tax. Consumers indicated that the money generated from the SSB tax should be used to subsidise healthy foods or researching cures for diseases exacerbated by excessive sugar consumption.

When those who did not purchase or consume SSBs were excluded from the analysis, it was found that about half of the consumers would make healthier beverage choices, after the implementation of the SSB tax. They indicated that they would either buy SSBs less often, buy SSBs in smaller quantities or stop buying SSBs and buy some other beverage instead. Only one fifth of consumers indicated that they would continue to buy SSBs in the same quantity and with the same frequency, as they did before the SSB tax was introduced. Half of the consumers indicated that they would choose water as an alternative, if SSBs were no longer affordable to them. The second most common alternative was 100% fruit juice, followed by milk and milk products. A third of consumers suggested that the South African government should increase nutrition education and awareness of diseases, health and SSBs in order to reduce the prevalence of obesity. In addition, it was suggested that the South African government should support an increase in physical activity as well as its affordability. These results are relatively new to South Africa and serve as important baseline data for future studies on the SSB tax.

6.2 Study limitations

6.2.1 Only seven out of 17 shopping centres in Pietermaritzburg gave permission for the study to be conducted at their premises. The consumers who participated were not representative of the Pietermaritzburg population and this also prevented generalised conclusions from being drawn.

6.2.2 Because the South African SSB tax is relatively new, there are limited published South African research findings to compare the results of this study to.

6.3 Recommendations

6.3.1 The revenue generated from the SSB tax should be used to subsidise healthy foods, such as fruit and vegetables, and for researching cures for diseases exacerbated by excess sugar consumption.

6.3.2 Government officials and health care workers should constantly raise awareness of SSBs and its harmful effects on health as well as the aim of the SSB tax.

6.3.3 Changes made by the beverage industry since the implementation of the SSB tax should also be monitored. The beverage industry should continue formulating ‘light’ or ‘zero’ products and emphasise portion control with SSBs.

6.3.4 If jobs were to be lost due to the SSB tax, the South African government should implement a strategy to address this.

6.3.5 In addition to the SSB tax, South Africa should continue to implement other strategies to combat obesity. This should include increasing opportunities for physical activity and increasing nutrition education.

6.4 Recommendations for further research

6.4.1 Long-term studies which show the impact of the South African SSB tax are needed. In order to undertake a study such as this, two factors should be screened before and after the implementation of the SSB tax. These include the SSB sales amounts and the SSB consumption trends. There should be ongoing research on the impact of the SSB tax on obesity, NCDs, daily energy balance and life expectancy.

6.4.2 Researchers should determine whether purchasing behaviours in response to the SSB tax are leaning towards high fat and high energy alternatives. This would ultimately lead to knowledge about weight gain among consumers due to the SSB tax. This could be done by tracking the changes in weight and dietary patterns of consumers before and after the implementation of the SSB tax.

6.4.3 The impact of the SSB tax on the South African economy must be determined. Unemployment and poverty are of major concern in the country and factors to be explored include job losses, the effect on the GDP, savings to the health care sector, revenue for the government and implementation costs.

6.4.4 The consumer reactions to the SSB tax should be investigated over time. This type of study should include factors such as public knowledge, acceptability, feasibility and attitudes towards the SSB tax.

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APPENDIX A: QUESTIONAIRE

AWARENESS, ATTITUDES AND RESPONSE TO THE SUGAR-SWEETENED BEVERAGE TAX AMONG CONSUMERS IN PIETERMARITZBURG, KWAZULU-NATAL

Thank you for your participation in this research project, for a Master of Science in Dietetics.

Objectives of the Study:

1. To determine if consumers in Pietermaritzburg, KwaZulu-Natal are aware of the sugar-sweetened beverage tax.
2. To determine the demographic characteristics of consumers who are aware of the sugar-sweetened beverage tax in Pietermaritzburg, KwaZulu-Natal.
3. To determine the attitudes of consumers in Pietermaritzburg, KwaZulu-Natal towards the sugar-sweetened beverage tax.
4. To determine the response of consumers in Pietermaritzburg, KwaZulu-Natal to the sugar-sweetened beverage tax in South Africa, in terms of purchasing behaviour.

Please answer all questions honestly. Tick the appropriate answer or fill in where required. Queries can be directed to the researcher. Please note that your responses are anonymous and will be kept strictly confidential.

Shopping mall: ……

Subject code: ……

SECTION A: DEMOGRAPHICS AND AWARENESS OF THE SUGAR TAX

1. **How old are you?**

18-20 years	
21-30 years	
31-40 years	
41-50 years	
51-60 years	
61-70 years	
>70 years	

2. What is your race group?

White	
Black	
Indian	
Coloured	
Other	

3. Which of the following is your highest education qualification?

No formal education	
Grade 11 or less	
Matric	
College/ certificate	
Technikon/ diploma	
University/ degree	

4. Have you been medically diagnosed and/or treated for any of the following conditions? (Tick ALL that apply)

4.1	Diabetes	
4.2	High blood pressure	
4.3	High cholesterol	
4.4	Overweight or obesity	
4.5	Other	
4.6	No medically diagnosed conditions	

If other was specified, please explain……

5. How many people, including yourself, live in your household?

I live alone	
Two	
Three	
Four	
Five	
Six or more	

6. What is your total household monthly income?

R0-R5000	
R5001-R10000	
R10001-R15000	
R15001-R20000	
R20001-R25000	
R25001-R30000	
R30001-R35000	
R35001-R40000	
More than R40000	
I do not know	

7. Are you responsible for purchasing the groceries each month?

Yes	
No	

8. <u>If NO to question 7</u>, who purchases the groceries <u>most often</u>? (Select ONE option only)

Parent/s	
Grandparent/s	
Sibling/s	
Aunt/uncle	
Friend	
Spouse or partner	
Other	

If other was specified, please elaborate……

<u>If you answered 'YES' to question 7, please continue answering questions 9 and 10.</u>
<u>If you answered 'NO' to question 7, please proceed to question 11 and leave out questions 9 and 10.</u>

9. How much money do you spend on food each month for the household?

Less than R500	
R501 to R1000	
R1001 to R1500	
R1501 to R2000	
R2001 to R2500	
More than R2500	

10. How much money do you spend on sugar-sweetened beverages each month for the household?

R0-R50	
R51-R100	
R101-R150	
R151-R200	
R201-R250	
R251-R300	
More than R300	

11. Do you drink any sugar-sweetened beverages such as soft drinks, fruit drinks, sports drinks, energy drinks, vitamin water, sweetened ice tea and/or lemonade?

Yes	
No	

If you answered 'YES' to question 11 please continue answering the questions.
If you answered 'NO' to question 11, please proceed to question 17 and leave out questions 12, 13, 14, 15 and 16.

12. How often do you purchase the following sugar-sweetened beverages?

Sugar-sweetened beverages	**0 times a week**	**1 - 2 times a week**	**3 - 4 times a week**	**5 - 6 times a week**	**Every day**
12.1 Soft drinks (e.g. Fanta, Coke, Sprite)					
12.2 Sports/energy drinks (e.g. Energade, Powerade)					
12.3 Squashes (e.g. Oros, Jungle yum, Halls)					
12.4 Iced tea					
12.5 Vitamin water					
12.6 Other sugar-sweetened beverage					

If other was specified, please elaborate…….

13. Indicate your level of agreement/disagreement that the following are the reasons why you purchase sugar-sweetened beverages (SSB):

Reasons for purchasing SSB	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
13.1 I have it as a drink option when going out, instead of alcohol (e.g. at restaurants/ family events).					
13.2 I enjoy the taste.					
13.3 To quench my thirst in hot weather.					
13.4 My family/ friends like to drink it.					
13.5 'It completes a meal.'					
13.6 I grew up drinking it; it is difficult to stop now.					
13.7 I use it for mixing with alcohol.					
13.8 It boosts my energy levels and keeps me alert.					

14. Indicate your level of agreement/disagreement that, when consuming a COLD beverage <u>in the following settings</u>, a sugar-sweetened beverage would be your cold beverage of choice:

Setting	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
14.1. At home.					
14.2 At work or varsity.					
14.3 Family 'get together'/parties/ braais/ weddings.					
14.4 At restaurants/take-aways.					
14.5 During/ after sports/gym					
14.6 A day out (e.g. park/beach).					

15. Indicate how important the following factors are to you when purchasing sugar-sweetened beverages.

Factors	Not at all important 1	2	3	4	Very important 5
15.1. The price.					
15.2 The brand.					
15.3 The sugar content.					
15.4 The taste.					
15.5 The advertisements for the product.					
15.6 The design and packaging of the product.					
15.7 Pressure from other people.					

16. Overall, rate how important (from 1 = not at all important to 5 = very important) sugar-sweetened beverages are to you:

Not at all important 1	2	3	4	Very important 5

17. Are you aware of the sugar-sweetened beverage tax, which was implemented in South Africa?

Yes	
No	

If you answered 'YES' to question 17 please continue answering the questions.

If you answered 'NO' to question 17, please read the note provided before continuing.

18. When was the sugar-sweetened beverage tax implemented? (Select ONE option only)

28 February 2017	
1 April 2017	
25 October 2017	
28 February 2018	
1 April 2018	
I do not know	

SECTION B: ATTITUDES TOWARDS THE SUGAR TAX

1. Indicate your agreement that you are in favour of the South African sugar-sweetened beverage tax.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

2. Please provide a reason for your response to the question above?

……

……

3. From the options provided below, what would you *most* prefer the money generated from the sugar tax be used for? (Select ONE option only)

Funding anti- obesity interventions.	
Revenue for the government.	
Subsidising healthy foods.	
Researching cures for diseases exacerbated by excess sugar consumption.	

4. Indicate your agreement/disagreement with the following statements:

Statements	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
4.1 The South African sugar tax will help to reduce obesity in South Africa.					
4.2 The South African sugar tax will help to reduce the consumption of sugar-sweetened beverages amongst consumers.					
4.3 The sugar tax is a money-generating scheme by the government.					
4.4 The South African sugar tax will negatively affect the economy due to job losses.					
4.5 The government should be allowed to influence your beverage purchasing decisions.					

SECTION C: RESPONSE TO THE SUGAR TAX

1. Indicate your response to the sugar tax by selecting <u>ONE</u> of the following practices that applies to you:

Following the introduction of the sugar tax on sugar-sweetened beverages, I will…	
…continue to buy sugar-sweetened beverages (SSB) in the same quantity and with the same frequency that I did before the tax was introduced.	
…still buy SSB, but less often.	
…still buy SSB, but in smaller quantities (cans/bottles).	
…stop buying SSB's and rather buy some other beverage.	
This does not apply to me, as I do not buy SSB at all.	

2. If the sugar-sweetened beverages were no longer affordable to you, which <u>alternatives</u> would you consider buying? (Tick ALL that apply)

2.1	This does not apply to me, as I do not buy SSB anyway.	
2.2	Sweets, cakes and treats.	
2.3	Milk and milk products.	
2.4	100% fruit juice.	
2.5	Sugar-free drink options.	
2.6	Water	
2.7	Other	

If other was specified, please explain……

3. What other approaches, in your opinion, should the government implement in order to reduce obesity rates in the country?

……

……

……

……

……...

<u>Thank you for answering these questions.</u>

<u>Your time and effort is much appreciated.</u>

APPENDIX B: INFORMATION SHEET AND CONSENT TO PARTICIPATE IN RESEARCH

INFORMATION SHEET AND CONSENT TO PARTICIPATE IN RESEARCH

Date: _____

Dear Sir/Madam,

My name is Nikita Baijnath and I am currently a registered Masters student in the Discipline of Dietetics & Human Nutrition at the University of KwaZulu-Natal.

You are invited to consider participating a study, which aims to determine the awareness, attitudes and response to the sugar-sweetened beverage tax among consumers in Pietermaritzburg, KwaZulu-Natal.

The aims and purpose of the study are as follows:

- To determine if consumers in Pietermaritzburg, KwaZulu-Natal are aware of the sugar-sweetened beverage tax.
- To determine the demographic characteristics of consumers who are aware of the sugar tax in Pietermaritzburg, KwaZulu-Natal.
- To determine the attitudes of consumers in Pietermaritzburg, KwaZulu-Natal towards the sugar-sweetened beverage tax.
- To determine the response of consumers in Pietermaritzburg, KwaZulu-Natal to the sugar-sweetened beverage tax in South Africa, in terms of purchasing behaviour

The study is expected to enrol consumers (18 years or older) of all race groups who reside in Pietermaritzburg.

The procedure for the study is as follows:

1) If you give your consent for participation in the study, a questionnaire will be handed to you. The questionnaire will consist of approximately 25 questions related to your awareness, attitudes and response to the South Africa sugar-sweetened beverage tax. Please

answer these questions as accurately and truthfully as possible. There are no right or wrong answers. When you have completed the questionnaire, you may hand it back to the researcher.

2) Once the questionnaire has been completed, please return it to the researcher.

Please note this study will not provide any direct benefit or harm to the study participants.

The study will be anonymous and voluntary. Each participant will be allocated a code, and his/her name will not be required on the questionnaire. You may withdraw from the study at any point, should you wish to do so, with no penalties incurred.

Data collected from the study will be stored, securely locked away. After a 5-year period, the data will be shredded and destroyed.

This study has been ethically reviewed and approved by the UKZN Biomedical Research Ethics Committee (protocol reference number: HS/0899/018M).

In the event of any problems or concerns/questions, you may contact the researcher at:

Researcher	Miss Nikita Baijnath	Nikita.Baijnath333@gmail.com	063 689 1549
Supervisor	Dr Kirthee Pillay	PillayK@ukzn.ac.za	033 260 5674

OR

HUMANITIES AND SOCIAL SCIENCES RESEARCH ETHICS COMMITTEE

Research Office, Westville Campus
Govan Mbeki Building
University of KwaZulu-Natal
Private Bag X 54001, Durban, 4000
KwaZulu-Natal, SOUTH AFRICA
Tel: 27 31 2604557 - Fax: 27 31 2604609
Email: Hssrec@ukzn.ac.za

Reference number: HSS/0899/018M

CONSENT

I …….. (Name) have been informed about the study entitled: "Awareness, attitudes and response to the sugar-sweetened beverage tax among consumers in Pietermaritzburg, KwaZulu-Natal" by Nikita Baijnath.

I understand the purpose and procedures of the study.

I declare that my participation in this study is voluntary and that I may withdraw at any time.

If I have any further questions/concerns or queries related to the study I understand that I may contact the researcher on email at Nikita.Baijnath333@gmail.com or telephonically at 063 689 1549.

If I have any questions or concerns about my rights as a study participant, or if I am concerned about an aspect of the study or the researchers then I may contact:

HUMANITIES AND SOCIAL SCIENCES RESEARCH ETHICS COMMITTEE

Research Office, Westville Campus
Govan Mbeki Building
University of KwaZulu-Natal
Private Bag X 54001, Durban, 4000
KwaZulu-Natal, SOUTH AFRICA
Tel: 27 31 2604557 - Fax: 27 31 2604609
Email: Hssrec@ukzn.ac.za

Reference: HSS/0899/018M

I hereby consent to participating in this research project.

_____ _____

(Signature) Date

APPENDIX C: ETHICS APPROVAL LETTER FROM UKZN

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

5 September 2018

Miss Nikita Baijnath 213535153
School of Agricultural, Earth And Environmental Science
Pietermaritzburg Campus

Dear Miss Baijnath

Protocol reference number: HSS/0899/018M
Project title: Awareness, attitudes and response to the sugar-sweetened beverage tax among consumers in Pietermaritzburg, KwaZulu-Natal

Full Approval – Expedited Application

In response to your application received 26 July 2018, the Humanities & Social Sciences Research Ethics Committee has considered the abovementioned application and the protocol has been granted **FULL APPROVAL**.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment /modification prior to its implementation. In case you have further queries, please quote the above reference number.

PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

The ethical clearance certificate is only valid for a period of 3 years from the date of issue. Thereafter Recertification must be applied for on an annual basis.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

Professor Shenuka Singh (Chair)
Humanities & Social Sciences Research Ethics Committe

/pm

cc Supervisor: Dr Kirthee Pillay
cc. Academic Leader Research: Professor O Mutanga
cc. School Administrator: Ms Maryna Manjoo

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1910 - 2010
100 YEARS OF ACADEMIC EXCELLENCE

Founding Campuses: Edgewood, Howard College, Medical School, Pietermaritzburg, Westville